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dFacts Are In.

DATABASE COMPARISON TABLE	dBASE IV version 1.1	Paradox version 3.5	FoxPro version 1.02
EASE OF USE			
Control Center organizes data, queries, forms, reports, labels, applications on <u>one</u> screen	Yes	No	No
Create applications <i>without programming</i>	Yes	Yes	No
Modern pulldown menus for all Design Tools	Yes	No	Limited
Query by Example (QBE) for easy access to information	Yes	Yes	No
Context specific help by menu item	Yes	No	No
PRODUCTIVITY			
Quick Layout for automatic forms, reports <u>and</u> labels	Yes	No	Yes
Application Generator for quick application development	Yes	Yes	No
Automatic code generation for all Design Tools	Yes	No	No
Automatic maintenance of <u>multiple</u> indexes for ordering data	Yes	No	No
Memo fields for notes, letters, descriptions	Yes	No	Yes
POWER & FLEXIBILITY			
Bold, underline, italic, subscript, superscript text for high impact reports and labels	Yes	No	No
User Defined Functions for extending programming language	Yes	No	Yes
Data input validity checking in forms	Yes	Yes	Yes
Multi-user transaction processing ensures data integrity	Yes	No	No
Number of file formats imported/exported	7	6	3
INDUSTRY STANDARDS			
#1 Selling, #1 Rated multiuser database; over 3 million users (1)(2)	Yes	No	No
Compatible with dBASE III PLUS data and applications	Yes	No	Yes
Compatible versions for DOS, VAX VMS, Macintosh, SunOS and other UNIX platforms (3)	Yes	No	Limited
Structured Query Language (SQL) integrated with programming language	Yes	No	No

(1) dBASE III PLUS and dBASE IV comprise approximately 55% of PC database systems sold (3 times nearest competitor) according to the most recent report by the market research firm Audits & Surveys (Oct. 1990) (2) Software Digest rated dBASE IV #1 among multiuser databases, October 1990 (3) Versions of dBASE IV are shipping for DOS, VAX, and SunOS. Macintosh and other UNIX Platforms are announced.

Based on what our customers tell us, we made a list of some of the most important features to look for in data management software.

Then we compared the new dBASE IV® version 1.1 with two other database products.

As you can see, dBASE IV offers exclusive advantages in

many categories.

For instance, only dBASE IV lets you access all its functions from a single screen. Called the Control Center, this screen lets you manage existing data, and create new tables, queries, reports, forms and labels totally without programming.

When all the facts are on the table, it's easy to see which database software is best.

Of course we aren't the only ones who have come to this particular conclusion.

Software Digest rates dBASE IV version 1.1 the #1 Multiuser Database (Vol. 7, No. 13, Oct. '90).

dTruth Comes Out.

Software Digest

RATINGS REPORT

Volume 7 Number 13

The Independent Comparative Ratings Report
for Selecting IBM PC Business Software

MULTIUSER DATABASE PROGRAMS

Ratings Key: ■ 70-100 ■ 50-69 ■ under 50

Software Digest Rating	Overall Evaluation	Overall Power	Program Name	Version Tested	Performance	Versatility	Error Handling	Ease of Learning	Ease of Use	Memory Requirement	Price	Volume	Purchase Agreement
***	70	6.7	dBase IV	1.1	■	■	■	■	■	450KB	\$795	✓	28
**	6.8	5.1	Paradox	3.5	■	■	■	■	■	640KB	\$995	✓	32
**	6.8	7.1	FoxPro/LAN	1.02	■	■	■	■	■	512KB	\$1,095	✓	30
**	6.4	5.1	DataEase	4.2	■	■	■	■	■	640KB	\$750	✓	26
*	5.8	3.6	R:Base	3.0	■	■	■	■	■	520KB	\$995	✓	34
*	5.7	6.0	Clarion Professional Developer	2.1	■	■	■	■	■	512KB	\$845	✓	24
*	5.7	6.6	Advanced Revelation	2.01	■	■	■	■	■	640KB	\$995	✓	22

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Perhaps the most independent publication in the industry, *Software Digest* accepts no advertising whatsoever. Corporations pay hundreds of dollars a year to receive their monthly reviews—which are considered highly unbiased and objective. Their exhaustive, 75-page report concludes:

"Among the top ranking programs, dBASE IV (version 1.1) is the most well-rounded, with solid performance, versatility, and usability." Commenting on speed, *Software Digest* points out that "dBASE IV produces all three test reports as fast as or faster than FoxPro/LAN." As for Ease of Use and Ease of Learning, dBASE IV scored in the Excellent Range as many times as any other multiuser database product tested.

For a free evaluation kit, including competitive details and a free demo disk, call toll-free: 1-800-437-4329 ext. 1416. Better yet, call 1-800-2ASHTON to upgrade to the new dBASE IV now.

The truth is, no other database can do so much to improve productivity.



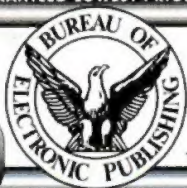
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Inside

Most new employees get a week or so to adjust before they have to tackle a full workload. Not PC Magazine Labs' new hardware team project leader, Michael J. Zulich. No sooner had Zulich found his office than he was being whisked away to PC Labs' beta-testing room to torture-test the Super VGA monitors that you will be reading about in this issue.

Zulich and PC Labs' senior technical analyst, Steven W. Plain, heroically tested all 22 monitors in only six days. To achieve the most thorough evaluation of each monitor, Zulich and Plain used PC Labs' Microvision Superspot 100 testing unit, which



Hardware team project leader Michael J. Zulich spent his first week with PC Magazine meticulously testing 22 Super VGA monitors.

consists of an optic module and a specially configured AT-class computer that together measure the amount of light emitted from individual portions of the screen.

Using the data provided by the Superspot and under the direction of PC Labs' technical director, Robert W. Kane (the previous hardware team project leader), Zulich compiled a detailed analysis of each monitor's performance. "Although we concentrated on examining both VESA's new 72-Hz vertical refresh standard and the issue of harmful monitor emissions," says Zulich, "we definitely found that 72-Hz compliance is more important to today's buyer than any low-emis-

sions claim. No one has been able to provide conclusive evidence for or against emissions, while the amount of eyestrain you experience at 56 Hz compared with a steady 72-Hz image makes for a clear ergonomic improvement."

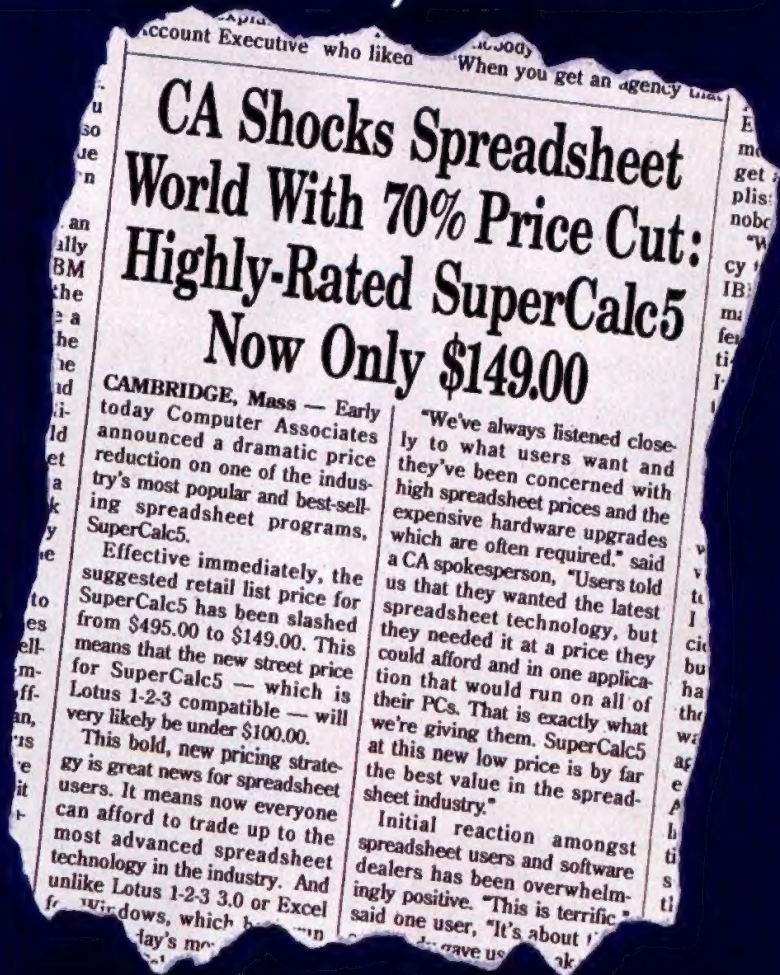
Zulich came to PC Labs in February of this year after 14 years of MIS experience with three major New York

banks: Manufacturers Hanover Trust Co., Morgan Guaranty Trust Co., and Chase Manhattan Bank. Zulich's role as project leader involves developing and supervising the testing of hardware products such as printers, graphics adapters, and PC components.

Along with Zulich's first project, "Mainstream Monitors: What Really Matters," this issue treats you to a First Look at Microsoft's DOS 5 upgrade. This version of everyone's favorite operating system offers all kinds of improvements like high and extended memory handling as well as task switching, but it's also the first DOS version ever to be sold retail. Also be sure to read PC Magazine's first-ever in-depth examination of palmtop PCs, including Hewlett-Packard's new 95LX. These diminutive systems may have started out as little more than toys, but they've grown considerably in sophistication and power. —Oliver Rist

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This year, millions of DOS users will move to the kind of graphical computing Apple® Macintosh® personal computers first made popular over eight years ago.

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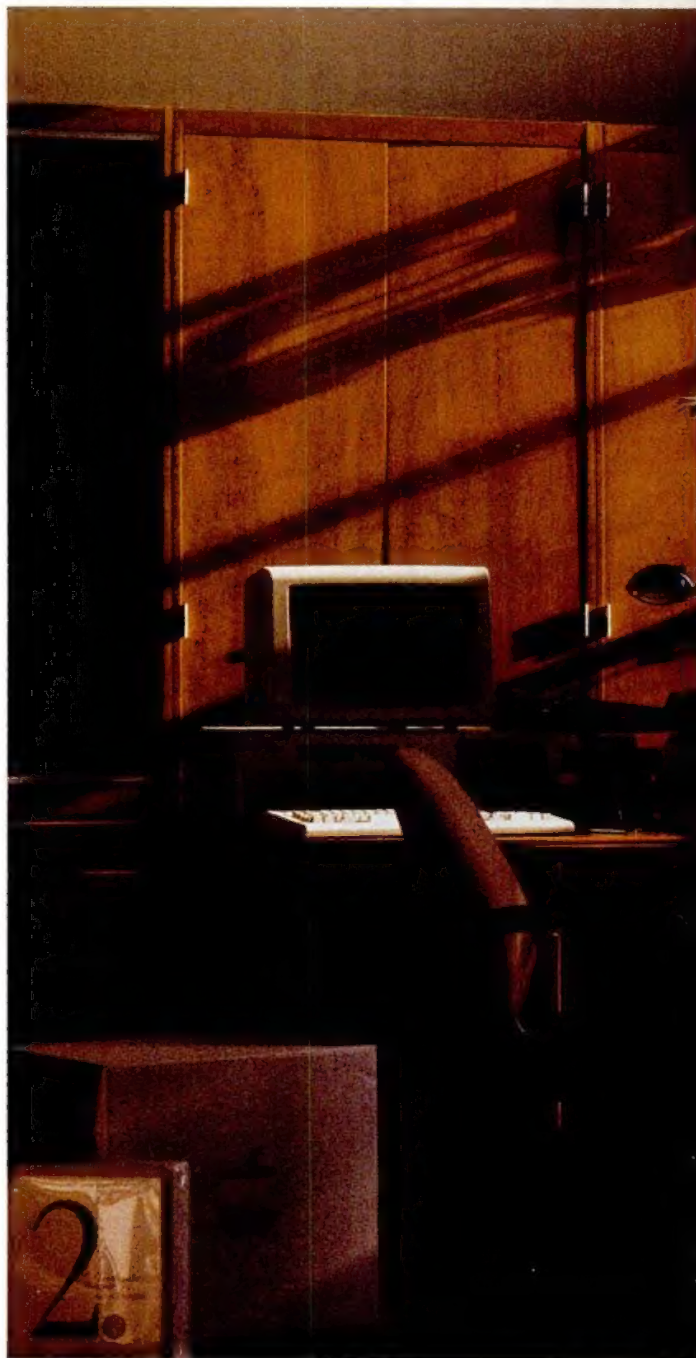
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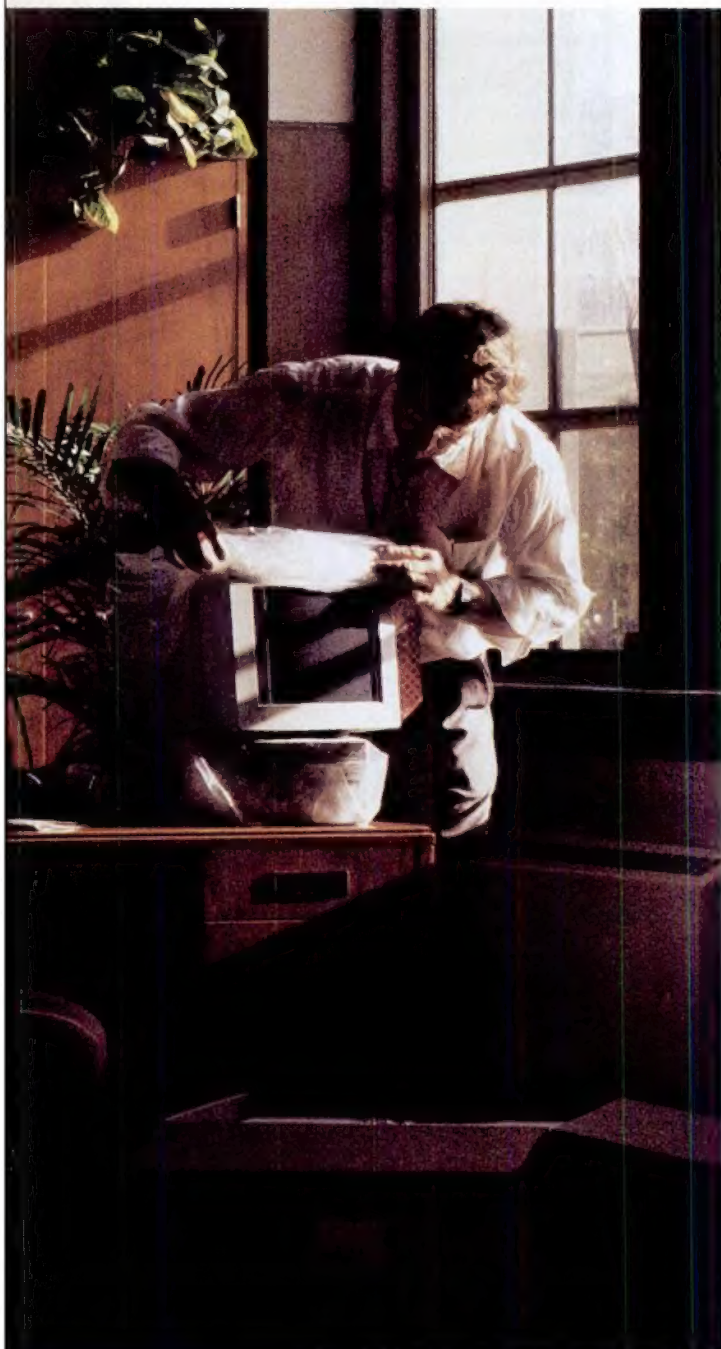
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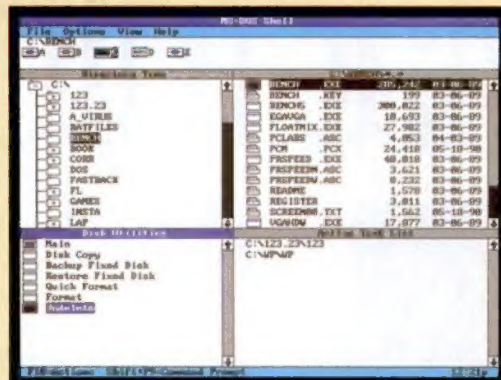
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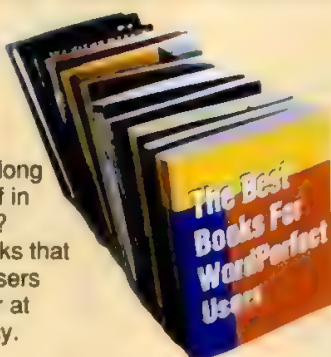
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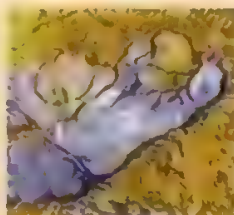
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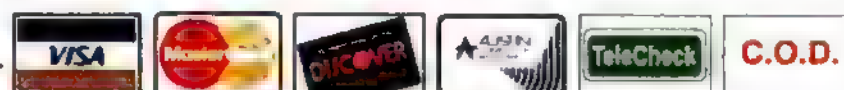
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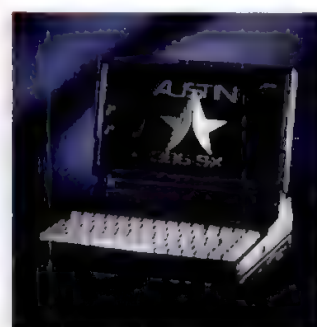
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Letters

MULTIMEDIA IS THE FUTURE

John C. Dvorak is at it again ("Myth, Mystique, Mania, and Microsoft," April 16, 1991). He accuses Microsoft of lacking breadth of vision. Then he attacks its work on multimedia, "Who among us needs to program elaborate multimedia presentations? Nobody I know."

Multimedia is a grandiose scheme to unite still and motion video, graphics, and sound. The goal is to expand computer capabilities for education and entertainment, as well as business. But of course Dvorak never sees beyond his own narrow interests. It's time to can the ham.

William Sommerwerck
Bellevue, Washington

WHICH SOFTWARE IS INTUITIVE?

John C. Dvorak is totally out of line in his March 12, 1991, column, "The 'Intuitive' Computing Myth." I think he needs to brush up on the meaning of the word *intuitive*. Intuitive does not necessarily mean ease of use. We have a different term for that: user-friendly.

Intuitive software anticipates your next logical step in a process and automatically selects that particular option in the menu.

If John had ever installed Novell's *NetWare*, he would know what intuitive software really is. During *NetWare* installation, the software automatically highlights the appropriate option in the menu as you go from one phase to the next. That's intuitive.

Deepak Thakkar
Cliffside Park, New Jersey

IS SOFTWARE REALLY GOING UP IN FLAMES?

As a software producer, I read with interest the various letters on replacing software. It has been our policy here at DiagSoft to replace damaged or destroyed disks (at a small handling charge) if the user has registered the product.

Lately, and I don't know if your Letters column is the reason, we have had 10 to 15 different people request replacement



copies because of fire. What we have done is request a copy of the fire department report. Only one produced the report. Does this mean we were getting burned?

Don Harris
Vice President Marketing and Sales
DiagSoft Inc.
Scotts Valley, California

WHEN DO COMPUTERS WEAR OUT?

In Jim Seymour's column ("What's the Right PC for Today?" March 12, 1991) he said that "It's hard to settle on a machine that is right today, and will still be right over the next three years—the IRS depreciation period for personal computers."

Can you tell me the source of your information on the IRS depreciation rule for personal computers? The tables I have seen list five years for computer equipment and peripherals, and do not specifically break out personal computers as subject to special rules. The tax impact of such a difference could be substantial.

Stan Pickett
Rockville, Maryland



Ah, the perils of editing with a word processor. The line originally said the *useful* life of PCs was three years, while the IRS depreciation guidelines say five years. Last-minute cutting to fit lost that, and I did it myself—alas, no copy editor to blame.—Jim Seymour

Oh, the blindness of high tech! In his March 12, 1991, column ("What's the Right PC for Today?"), Jim Seymour complains that he can't find a shelf to put his monitor on and his keyboard under. A quick trip to his local lumber yard can yield some 1-by-12 inch #2 pine and half a dozen nails. The yard will cut it for him and 30 minutes later he can have a shelf. Not high tech, not even pretty, but I've been using mine for five years now. I love being able to shove the keyboard out of the way.

Samuel Green
Montague, Massachusetts

A WORD TO MICROSOFT

I've just started using DR-DOS 5.10. So far it beats anything I've seen at the DOS prompt as of yet. And a word to Microsoft: If you can't top Digital Research with MS-DOS 5.0, you can always make a bootable MS-DOS floppy disk, then copy all of DR DOS's files except COMMAND.COM, package it, and label it MS-DOS 5.1. When you type VER at the DOS prompt, I don't think anyone will know the difference.

Robert Gilio
Ardmore, Oklahoma

WHO SAID COMPUTERS MUST BE BEIGE?

Paul N. Weissler wonders why most computers are beige and yearns for a greater choice of colors (Letters, April 16, 1991).

A recently completed Master's thesis in the department of computer science and information systems at American University in Washington, D.C., shows that when there is a high contrast between the back-

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Rockville, Maryland



Ah, the perils of editing with a word processor. The line originally said the *useful* life of PCs was three years, while the IRS depreciation guidelines say five years. Last-minute cutting to fit lost that, and I did it myself—alas, no copy editor to blame.—Jim Seymour

Oh, the blindness of high tech! In his March 12, 1991, column ("What's the Right PC for Today?"), Jim Seymour complains that he can't find a shelf to put his monitor on and his keyboard under. A quick trip to his local lumber yard can yield some 1-by-12 inch #2 pine and half a dozen nails. The yard will cut it for him and 30 minutes later he can have a shelf. Not high tech, not even pretty, but I've been using mine for five years now. I love being able to shove the keyboard out of the way.

Samuel Green
Montague, Massachusetts

A WORD TO MICROSOFT

I've just started using DR-DOS 5.10. So far it beats anything I've seen at the DOS prompt as of yet. And a word to Microsoft: If you can't top Digital Research with MS-DOS 5.0, you can always make a bootable MS-DOS floppy disk, then copy all of DR DOS's files except COMMAND.COM, package it, and label it MS-DOS 5.1. When you type VER at the DOS prompt, I don't think anyone will know the difference.

Robert Gilio
Ardmore, Oklahoma

WHO SAID COMPUTERS MUST BE BEIGE?

Paul N. Weissler wonders why most computers are beige and yearns for a greater choice of colors (Letters, April 16, 1991).

A recently completed Master's thesis in the department of computer science and information systems at American University in Washington, D.C., shows that when there is a high contrast between the back-

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PRODUCT REVIEW

Tri-Star Leads 33MHz 486 PC Pack

Eight Low-Cost Systems Perform Well; Video and Hard-Disk Components Vary

By David Claiborne

In 1991, you could buy the state-of-the-art 486's from...

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"Tri-Star is king of the 33MHz 486 Mountain."

PC WEEK

Analyst's Choice, February 18, 1991

Tri-Star Computer continues to outdistance the pack as America's preferred supplier of high-end 486 Workstations. Read the reviews and you will understand why Tri-Star is the undisputed 486 champ.

"Tri-Star's 486/25 rates honorable mention for its thoughtful design touches, two year warranty and excellent service program."

PC Magazine
Editor's Choice Honorable Mention,
September 11, 1990

"Tri-Star's edge is its good documentation and excellent service policy."

PC Sources
486/33 Lead Review, February 1991

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Keyboard The layout of a keyboard and the size of the keys make all the difference in the world. Is there a large enter key? Is the "Ctrl" key in one of the two normal spots? Are the arrow keys arranged in an inverted "T" fashion? Is there an external keyboard connector?

Size How easily will the notebook, along with the AC adapter, fit into a brief case? Specifically, will the notebook fit side-ways into half of your briefcase? Sounds minor, but it's important.

Speed You can never have too much of this valuable commodity. A 12 or 16MHz machine may be adequate for some uses but Windows users and those who operate in graphics-intensive environments really appreciate the extra MIPS.

Memory Expansion: Does the computer use industry standard memory (SIMMs or SIPs), or does it use proprietary memory? If proprietary memory: (1) Will the company be around long enough to allow future upgrades? (2) How much does the proprietary memory cost? (3) What happens when a product is discontinued?



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Expansion Chassis / Docking Station: Availability of an expansion chassis will effectively guarantee your notebook's future in the event you eventually require a LAN adapter, scanner card, tape backup, or similar peripheral device.

Screen The good notebooks use the latest triple-twist LCD technology which provides great clarity and excellent readability. Low-end notebooks tend to use the older double-twist screens which will fade out when being viewed from an angle.

I/O Ports A complete notebook should have at least one parallel port, two serial ports, a VGA monitor port, K/B port for your favorite keyboard, and an internal modem slot.

Battery In general, a notebook's battery will carry a 2-hour charge or more. Is there a "suspend" button for use when the battery is replaced? How much does a spare battery cost? Recharger?

Return Policy: Regardless of the ad, make sure the money back guarantee is a no-questions-asked deal. And make them state specifically that there is no restocking fee. You want a couple weeks to see if you feel comfortable with the system. Be prepared, however, to pay the round-trip shipping charges if you choose to return the system.

Price The big thing here is value. Comparison shop the exact configuration you intend to own in six months. Do not assume that peripherals purchased later will be priced the same by all manufacturers. High-priced add-ons to a cheap system may reverse rankings made strictly on base prices.

Letters

then be influenced by those factors they deem most important.

Timothy J. Donovan
Montpelier, Vermont

TAKING COMPUTER GAMES SERIOUSLY

According to Barry Bresenal's review of *Wing Commander (After Hours, March 26, 1991)*, watching one of the game

When will PC manufacturers learn that there is no such thing as a "home computer?"

character's "cool, vicious infighting is a lot more inspiring than seeing her incongruously play the *shakuhachi* (a classical Japanese stringed instrument) at the local bar, for instance."

Actually, I would much rather see this, instead, since the *shakuhachi* (note the spelling) is a bamboo flute. I believe the instrument in question should have been a *shamisen*, a *satsumabiwa*, or else a *koto*.

Oh well. No matter how hard you try sometimes... Keep up the great work. And anyone who has the game, please let me know exactly which instrument she plays.

Jim Michalik
St. Charles, Illinois

THERE'S NO SUCH THING AS A HOME COMPUTER

When will PC manufacturers learn that there is no such thing as a "home computer?"

The term *home computer* suggests that people have computing needs that are uniquely related to their homes. In reality, this is simply not the case. People don't need computers because they are at home. What they need is useful software that offers satisfactory performance at a reasonable price. This is why Nintendo has penetrated deeply into American homes.

IBM and the rest of the PC world must

learn that people should be targeted primarily in terms of needs, and whether those needs occur at home, on the road, or at work. Only then will we stop seeing ill-defined efforts like the PS/1.

John B. Elmer
Houston, Texas

COMPARING APPLES AND ORANGES

PC Magazine continues to do its readers a disservice by evaluating PC server products using DOS benchmark tests ("IBM PS/2 Models 90 and 95: True 486 Power at Last," February 26, 1991).

Comparing the new IBM PS/2 Models 90 and 95 with the Compaq Systempro using DOS file access tests is like racing a Ford Escort with a Corvette in a parking lot; the situation does not allow an evaluation of the products under the real conditions of use: Both products will seem to perform equally. Realistic server benchmark tests run under one of the network operating systems and simulate the activity of many, many users—all demanding access to the server at the same time.

Gary Stimac
Senior Vice President,
Systems Engineering
Compaq Computer Corp.
Houston, Texas

CORRECTIONS & AMPLIFICATIONS

In our review of *Axum* from Trimetrix ("Picturing Your Numbers: 12 Technical Graphics Packages," March 26, 1991) we stated that *Axum* was "developed by the people who brought you *Gauss*, the well-known math/stat package." Though the founders of Trimetrix (Dr. Lee Edlefsen and Dr. Susan I. Ranney) did help to develop *Gauss*, they sold their interest in Aptech Systems (the owners of *Gauss*) in March 1988, and now have no relationship with Aptech.

HOW TO WRITE TO PC MAGAZINE

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March 26, 1991
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March 1991, Computer Shopper

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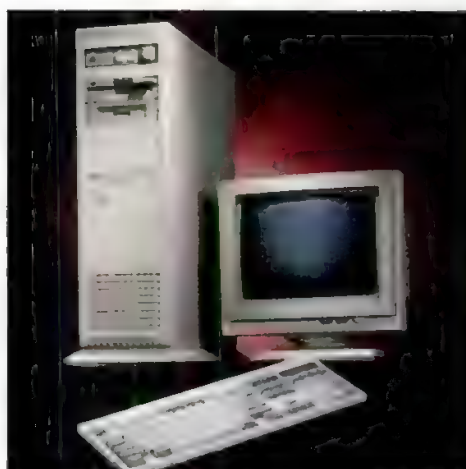


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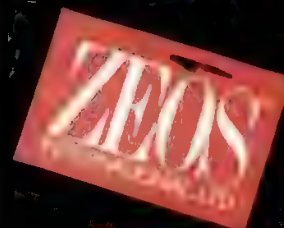
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WordPerfect® for Windows is
just around the corner, but
sales projections
are all over the map.



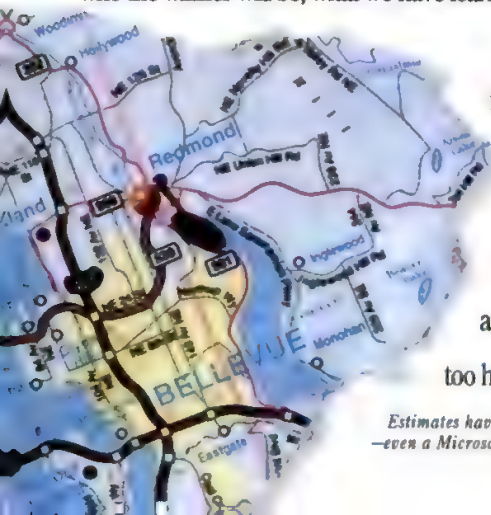
Thanks to everyone who called in with their estimates to help us calculate first-month sales projections for the soon-to-be-released WordPerfect® for Windows. You called in by the thousands, from near and far, from just down the road in Pleasant Grove, Utah, and from across the Pacific in Honolulu, Hawaii.

WordPerfect watchers in Tallahassee and Toronto have entered our contest to win \$25,000, which we'll pay to the one whose estimate comes closest to the actual orders for WordPerfect for Windows in its first 30 days on the market. And while we don't yet know who the winner will be, what we have learned is you're an enthusiastic bunch, you believe in our product, and you come in every variety.

Even a Microsoft employee called to enter the contest, estimating that WordPerfect for Windows will sell 80,000 copies in its first 30 days (we're flattered, since that's about twice what Microsoft's Winword® sells right now).

And three very gracious nuns in upstate New York called in and estimated a whopping 1,300,000 copies—hoping to use the winnings to benefit their spiritual center. But an equally inspired user, Reverend Father Michael Barclay, would say their estimate is a little too high. He puts first-month sales at 738,542. On the other hand, according to contestants at

Estimates have come in from just about everywhere, and from just about everyone—even a Microsoft employee in Redmond, Washington.



These three New York nuns are hoping to use the winnings to benefit their spiritual center.

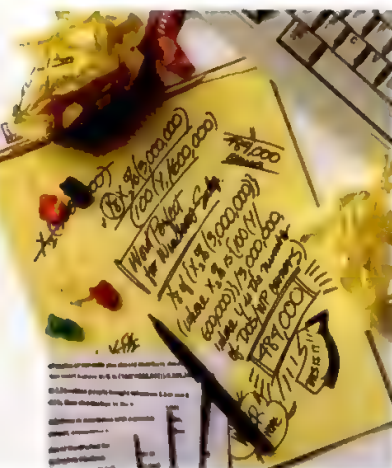


figures. One incredibly scientific approach was faxed to us by Hakki Öcal of Woodbridge, Virginia. He figured his estimate of 484,000 by calculating $1/8$ of $\{X_2\%(3,000,000)\}$ (where $X_2\%$ is $\{100(Y/600,000)\}/3,000,000$, where Y is the number of DOS/WP owners). *Whew*. On the other end of the spectrum, Charles Havekost said his estimate of 261,381 "just came to me" at a Grateful Dead concert. All we can say is, good luck to both.

So here's how the numbers added up:

Low: 0	Average: 640,955
High: 910,620,044	Median: 218,124

Some people put in all-nighters coming up with sales estimates for WordPerfect for Windows.



Contestants said they used everything from Ouija boards to Social Security numbers to arrive at their figures.



We appreciate all your entries and the enthusiastic anticipation of WordPerfect for Windows (Steven Boucher of Las Vegas actually said he's "drooling."). And although we're not as optimistic as some of you, Clive Winn, our Vice President of Marketing, has taken your estimates to heart. He'll be ready on the release date with 50,000 copies, and will have an additional 100,000 available within the first month. But remember, since the contest includes all *orders*, it's still anyone's guess.

We think the new WordPerfect for Windows will make all our customers winners in a sense, however. Because as Joel Leenaars of Richmond, California, put it, "Windows won't be a standard for me until WordPerfect for Windows comes out."

So stay tuned. It won't be long before we'll announce the winner. And even better, it won't be long before the new WordPerfect for Windows is on the shelf at your software dealer.

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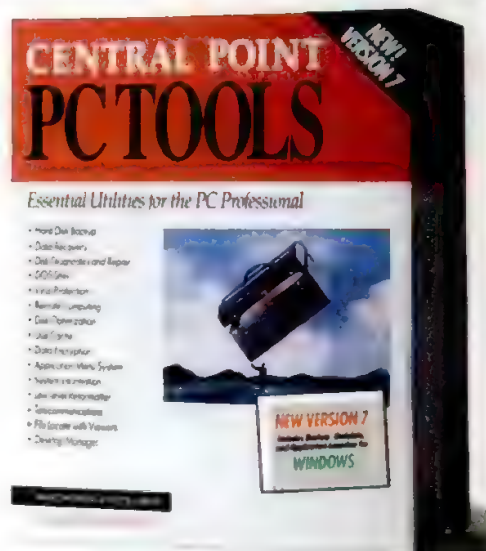
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CIRCLE 162 ON READER SERVICE CARD



by
Gus Venditto

Pipeline

A Look at the Trends Shaping the Personal Computer Market

Search for Speed Leads To Windows Coprocessor

More colors, higher resolution, and greater bandwidth are the main concerns of most video board developers, yet it's not clear if such schemes are likely to fix the one nagging problem that plagues every *Windows* and *OS/2* user: screen redraws take too long.

The most common solution to the problem is a system upgrade, increasing overall system performance by 25 or 50 percent at a cost of several thousand dollars. That may not be the best use for the money, since most

386-based PCs have plenty of power for every task they need to do—except for the calculation of several hundred thousand pixel colors every time the user presses the Down Arrow.

For most people, coprocessors like TI's 340x0 series and Intel's 860 are overkill. At a cost of over a thousand dollars, they're able to redraw millions of vectors in a second when all the typical user needs is to redraw a few lines of text displayed as a bitmapped font.

The best solution may turn

out to be hardware designed to speed the execution of the two software instructions that the typical *Windows* application relies on over and over.

Weitek, which has its roots in graphics display logic for Sun and Silicon Graphics workstations, is about to start selling controller chips that do just that for VGA boards.

The controller, the W5086, incorporates the most common Super VGA display modes but it offloads two key functions used by *Windows* and *OS/2*: bit-blitting (moving large groups of pixels) and line drawing.

These two instructions are at the heart of the most common *Windows* tasks: displaying text,

text scrolling, and word realignment during editing.

The weakness in Weitek's solution is its limited range; it assumes that you'll be satisfied with the current structure of *Windows* and *OS/2*.

On the other hand, its price is low enough (\$30 in volume) that it has the potential to become available at minimal extra cost. Because it works within the VGA design, it could also be used in conjunction with the color extensions that Sierra's HiColor RAMDAC provides (see First Looks review, June 25, 1991, page 33).

The main obstacle to the W5086's acceptance is the con-

CONTINUES ON PAGE 30



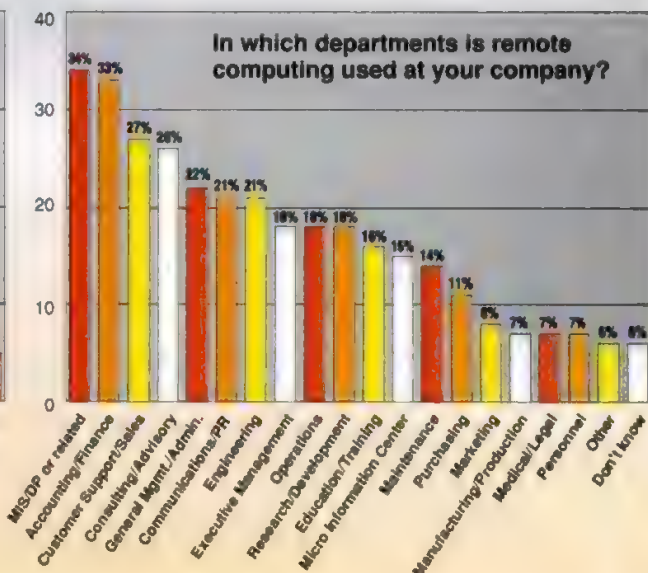
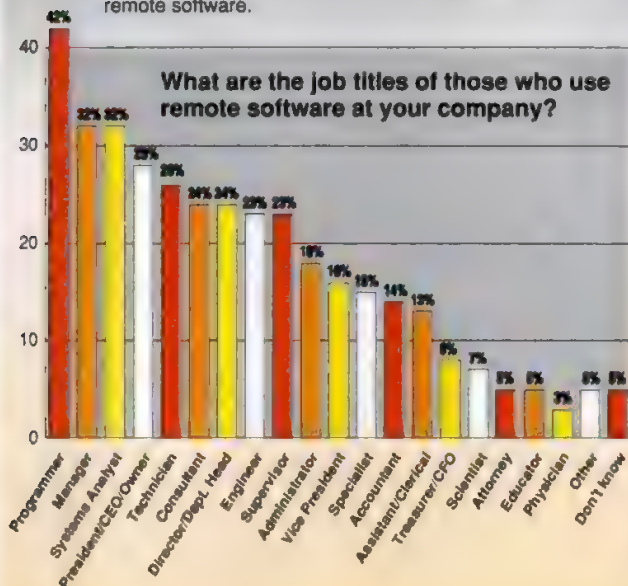
SURVEY: REMOTE COMPUTING KNOWS NO BOUNDS

PC MagNet callers are not typical computer owners. While it's true that PC MagNet users do use modems more often than the average PC user, there's no reason why they would be more likely to use remote communications software than other modem owners.

When we posted a MagNet survey on remote communications, 80 percent of the 1,241 respondents said that either they or others in their office used remote software.

To help learn why programs like *Carbon Copy* and *pcAnywhere* are perennial best-sellers, we asked about the way the programs were used.

Not surprisingly, maintenance and customer support were common answers, but the overall response indicates that remote software is used for a wide range of activities and is likely to be used by just about anyone.



Pipeline

CONTINUED FROM PAGE 29

tinuing development that Tseng Laboratories, Western Digital, and C&T are devoting to enhancing VGA with extra modes and higher clock speeds. As an outsider in VGA logic, Weitek will have a harder time convincing graphics board manufacturers to use the chip.

If Weitek succeeds, products should be on the market at the end of the year.

Intel Buys LANSystems

Intel's PCEO (Personal Computer Enhancements Operation) is the part of the company that looks beyond the world of silicon to the great market that Intel's processors have created.

Working independently, Intel PCEO develops or acquires products that it believes are part of an emerging market; AboveBoard, InBoard 386, and SatisfAXtion are typical offerings.

Noting growth opportunities in networking, the division has acquired LANSystems' Network Productions Division, which sells LANSpool, LANShell, and seven other utilities.

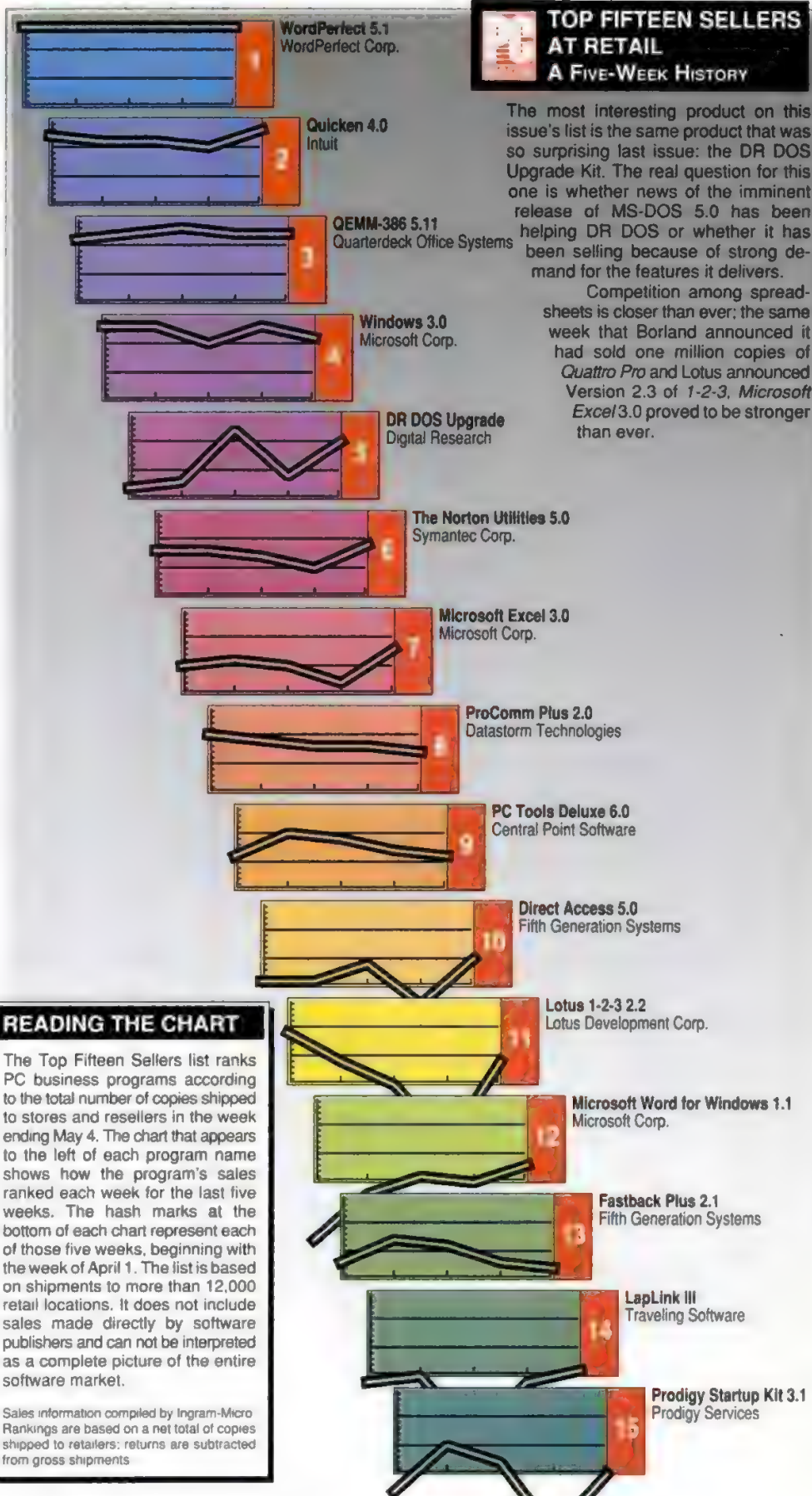
Sage Buys DACEasy

DACEasy made a name for itself in 1985 by creating a new market: low-end accounting software. Today, after selling 1.5 million copies of various programs, the company is swamped by competitors.

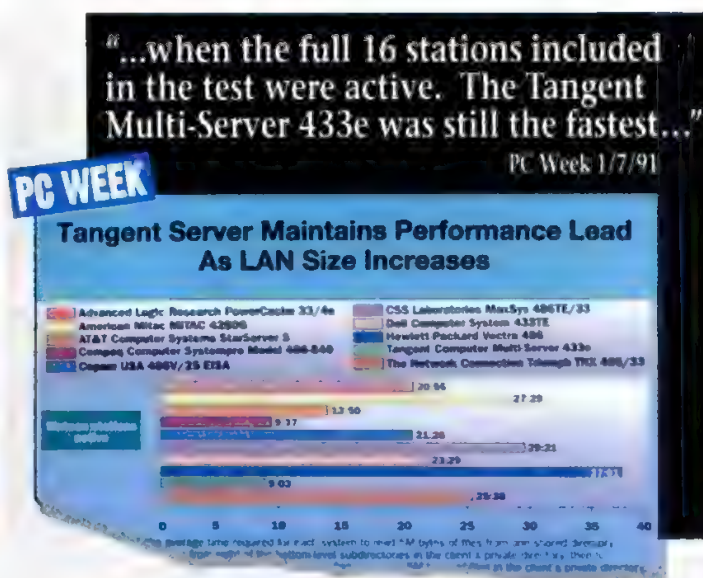
Like so many companies before, DACEasy is finding that the growth opportunities are emerging in connectivity—not an area where DACEasy has strength. As a result, the Sage Group—the British publisher that distributes the MainLan low-end network operating system here through US Sage—has acquired DACEasy.

Sage also publishes several high-end accounting programs that are popular in England, including the Sterling and Sovereign lines.

According to DACEasy CEO Kevin Howe, the merger will create "the largest provider of microcomputer accounting products in the world."



Once again, editors rave about the Tangent 486.



"A consistently strong performer across all tests, the Tangent model 433e stands out in this group." PC Magazine April 16, 1991

PC Magazine, April 16, 1991

PC MAGAZINE
EDITORS' CHOICE

April 16, 1991
Tangent 433e

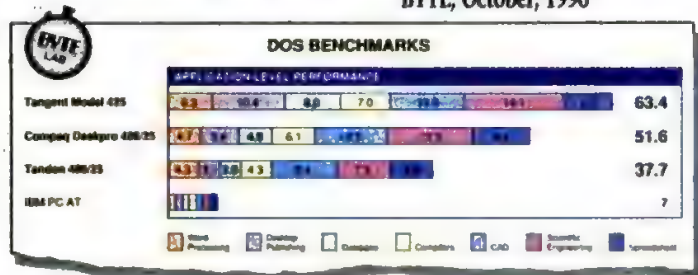
TANGENT COMPUTER INC.

Tangent Model 433e

by Bill O'Brien

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BYTE, October, 1990



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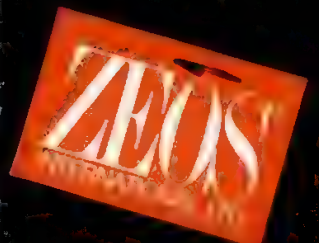
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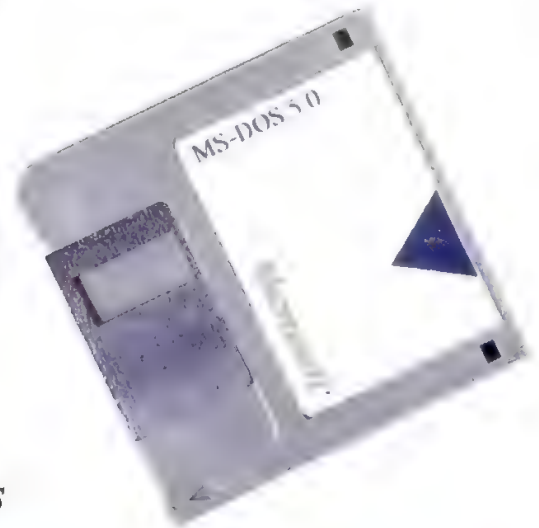
CIRCLE 165 ON READER SERVICE CARD

First Looks

Hands-on Reviews of the Latest Products

Everything DOS Should Have Been

DOS 5.0 Loads in High Memory, Undeletes Files, Has On-Line Help and Task Swapping



HANDS ON by Ray Duvall

Microsoft's release of the MS-DOS 5.0 Upgrade represents a red-letter day for over 50 million users of IBM-compatible PCs.

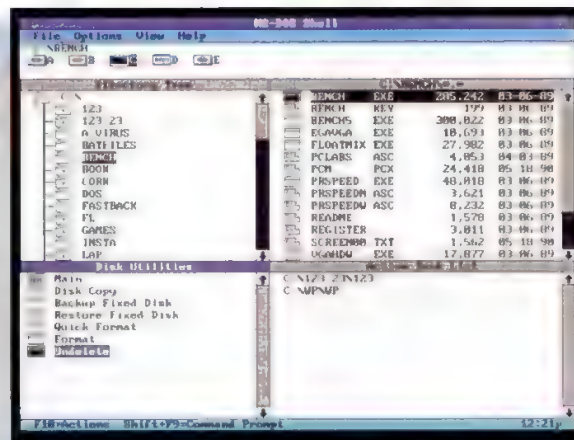
It's DOS's first update by Microsoft programmers since DOS 3.3 in 1987. DOS 4.0 was an IBM product that was later reverse-engineered at Microsoft for distribution to other PC makers. It's arguably the most important update since the release of DOS 2.0 in 1983.

DOS 5.0 is the first DOS version that can take any significant advantage of the extended memory available on 80286, 80386, and 80486 computers. It's a signal that Microsoft has awakened from its preoccupation with OS/2 and has realized that DOS will continue to be important.

And it marks some fundamental changes in Microsoft's relationship to DOS end users: The 5.0 upgrade will be sold to users through normal retail channels, and phone support will be provided directly by Microsoft.

The DOS 5.0 kernel has been restructured and streamlined. It is the first-ever version of DOS that needs less RAM than its predecessor. On 8086/88-based

CONTINUES ON PAGE 36



DOS 5.0's shell can be run in text mode or in one of five graphics modes, each offering a different number of lines per screen. This screen is in 34-line mode.

Two 1-2-3 Choices, A Third on the Way

HANDS ON by Craig Stinson

Even though the release of Lotus 1-2-3 for Windows is imminent, two new DOS-flavored upgrades of 1-2-3—Release 2.3 and 3.1 Plus—renew Lotus's commitment to the DOS world. Version 2.3, an enhancement to the classic 1-2-3, looks like stiff competi-

tion not just for archival *Quattro Pro*, but also for Release 3.1 Plus and the forthcoming 1-2-3 for Windows, as well.

To the underlying 2.2 engine, Release 2.3 adds WYSIWYG publishing, a *Magellan*-like file browser, an auditing add-in, more-efficient use of LIM 4.0 expanded memory, several new native graph types and custom-

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IBM's Hollywood
churns out
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AccPac and M.Y.O.B.:
Windows accounting
packages make tallying
the numbers easier
than ever 48

izing options (along with WYSIWYG's array of annotation features), a mouse interface (both inside and outside WYSIWYG), a DOS TSR for background printing and spool management, and more.

The good news is that none of this new functionality appears to impact the program's performance characteristics. Screen update and scrolling are marginally slower with WYSIWYG in place, but the recalc engine is still as fast as ever.

For the power user, Release 2.3's most important benefit is

CONTINUES ON PAGE 42

First Looks

DOS 5.0

CONTINUED FROM PAGE 35

PCs, DOS 5.0 requires about 5K less of conventional memory (memory below the 640K boundary) than DOS 4.0. Users who have hard disk partitions larger than 32MB will gain an additional 6K or so, because they will no longer need to load SHARE.EXE to use those partitions safely.

On 80286-, 80386-, and 80486-based machines, the DOS 5.0 kernel can be loaded into the so-called High Memory Area (HMA) with the aid of DOS's XMS-compatible memory manager, HIMEM.SYS. (The HMA is the first 64K of memory above the 1MB boundary that marks the end of conventional and beginning of extended memory.)

DOS 5.0 accesses HMA in the processor's real mode by a trick of memory addressing and the manipulation of the CPU's A20 address line. This reduces DOS's "footprint" in conventional memory, including HIMEM.SYS and COMMAND.COM, to less than 20K.

On 80386- and 80486-based machines, DOS 5.0's EMM386 memory manager can access Upper Memory Blocks (UMBs) between 640K and 1MB, and then use the CONFIG.SYS and AUTOEXEC.BAT commands DEVICEHIGH and LOADHIGH to load device drivers or TSRs into the UMBs.

DOS accomplishes this magic by using the 80386/486's hardware paging unit to remap extended memory into the "holes" between addresses owned by the ROM BIOS, video adapters, and other such devices.

On my own system, EMM386 delivered nearly 128K of extra memory in the form of UMBs. I was able to put my disk cache and all of my TSRs and network drivers into UMBs with room to spare, leaving some 628K of conventional memory available for application programs.

Finally, the restructuring of the kernel will also allow DOS to be executed directly out of ROM, which will free up additional conventional memory on notebooks and laptops when manufacturers take advantage of this capability.

DOS 5.0's interface—both the command line and the shell—have been improved, although these

improvements are often subtle.

For those who prefer the command line interface, DOS 5.0 offers on-line help and enhancements to command line editing. The user can enter the command HELP to see a list of all available DOS commands with a short description of their function, or they can enter HELP <commandname> to see a more detailed explanation of the command and its options.

The TSR utility, DOSKEY, is a command line history, editing, and macro facility analogous to that found in the popular shareware products 4DOS or CED. Previous commands can be recalled for modification and reuse, multiple commands can be entered on a single line by separating them with a Ctrl-T, and macros can be defined interactively or in a batch file. The macros can supersede COMMAND.COM's built-in commands (such as DIR) and can use replaceable parameters.

The DOS Shell, which made its debut in DOS 4.0, has been

completely rewritten. The new shell's appearance is similar to Windows 3.0, but the functionality of the Program Manager and the File Manager are combined. All operations can be carried out via the keyboard, but the full power of the shell becomes evident when you use a mouse.

Files can be quickly copied or moved using the mouse. Applications can be launched by clicking on the program's name in the Program Manager, clicking on the program's filename in the File Manager, or clicking on the filename of an associated data file.

The shell takes proper advantage of the graphics modes of the EGA and VGA adapters to generate a more attractive, informative display. Context-sensitive on-line help is available by pressing the F1 key.

One nice touch is that the shell remains responsive while it is building the current disk's directory tree.

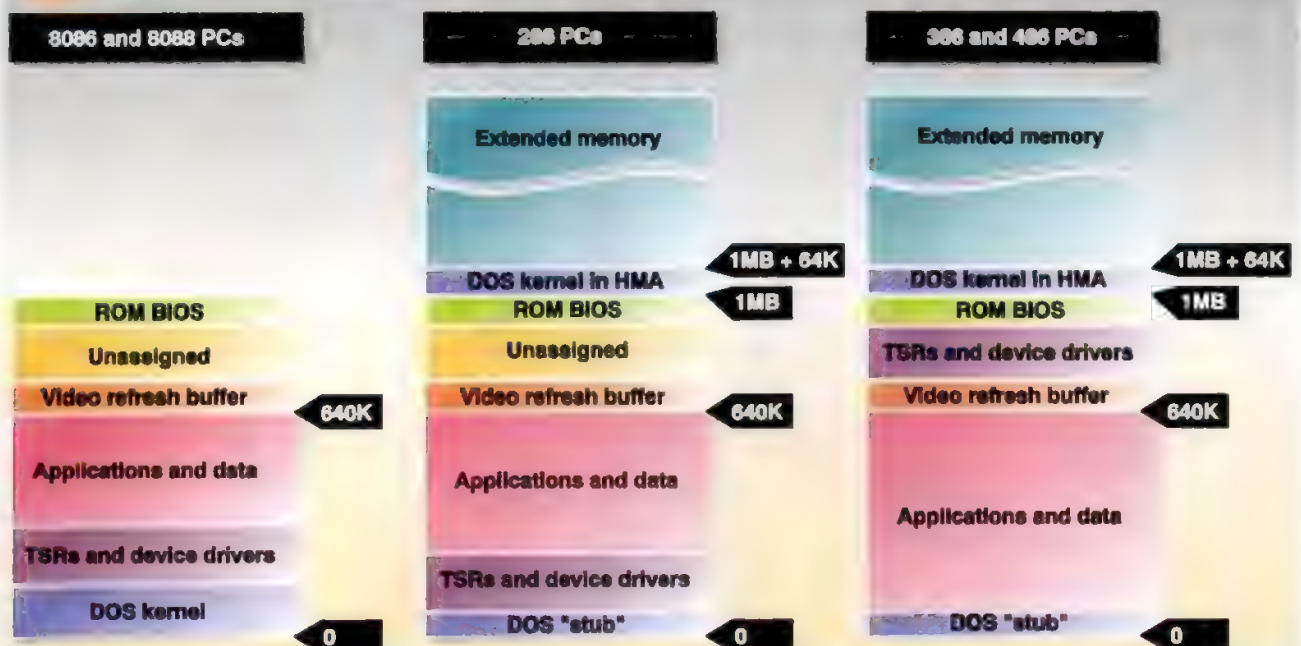
The most interesting feature of the shell is the inclusion of a

These memory maps of the three different processor classes show how DOS 5.0 uses the memory above 640K to free space below for applications and data. 386-based PCs that use shadow RAM may follow the same scheme used by 286 PCs.

DOS 5.0's use of memory on

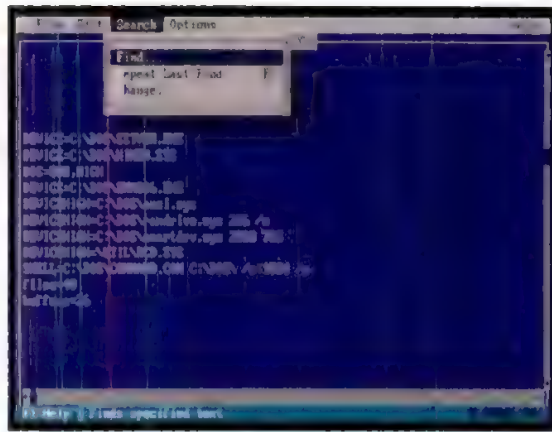
8088/86 PCs is similar to the scheme that all previous versions of DOS used; DOS 5.0 does save a small amount of RAM on these machines, in comparison with earlier versions, since it uses 5K less RAM and does not require that SHARE be loaded.

HOW DOS 5.0 SAVES MEMORY IN THE FIRST 640K



The Task List in DOS 5.0 is similar to the one used in *Windows* 3.0 when it is running in Real mode, that is, it does *not* provide DOS with multitasking capabilities. When the user switches from one program to another, the first program's execution is "frozen" and the memory image of the program's code and data is rolled out to disk for safe-keeping. Use of the Task List is optional, and it increases the shell's minimum memory overhead from

The DIR command, for example, now distinguishes between files and directories on the abbreviated (/w) listing, displays the total bytes for the files listed as well as the bytes free on the drive, can perform recursive searches of subdirectories to find a particular file, can select files for listing based on their attributes, and can sort the file list by name, extension, date, or size. You can also customize DIR's default display format with



EDLIN remains unchanged in DOS 5.0, but it has been overshadowed by the new **MS-DOS Editor**, which offers cut-and-paste and text search.

AFTER TEN YEARS, DOS BECOMES A RETAIL PRODUCT

The MS-DOS 5.0 Upgrade kit requires that an old version of DOS be running on the system; it will not install itself onto a non-bootable PC. But it is guaran-

Microsoft's relaunch gives users plenty of new features, but it also helps Microsoft bolster its long-range goals. DOS 5.0 has closer ties to *Windows* internally (SMARTDRV.SYS and HIMEM.SYS) and externally (the shell interface and task swapper). And that can only help Microsoft sell even more retail products—for both DOS and *Windows*. ■

GW BASIC has been replaced by a somewhat stripped-down version of Microsoft's QuickBASIC product. The full QuickBASIC language, integrated

SETUP determines your system hardware configuration and displays this information for confirmation. It gives you the option of backing up your hard disk before proceeding. **SETUP** then asks you to insert a blank floppy and creates a "panic disk"

CONTINUES ON PAGE 38

DOS 5.0

CONTINUED FROM PAGE 38

that contains the system files for your previous version of DOS and your old AUTOEXEC.BAT and CONFIG.SYS files. If something goes awry or the resulting DOS 5.0 system won't boot up, you can always insert the floppy and quickly restore the previous version of DOS.

After building the UNINSTALL floppy, and copying your old DOS utilities and commands to a subdirectory called OLD_DOS.1, SETUP prompts you to insert each of the DOS 5.0 distribution disks in order. SETUP searches your hard disk to replace all of the generic DOS utilities and device drivers with their new incarnations, but will preserve and rename OEM-specific versions of any utilities (such as MODE) so that they are still available.

After installation is complete, and you are satisfied that the new system works correctly, you can delete the files in OLD_DOS.1, either manually or by entering the command DELODDOS.

If certain application programs refuse to run under DOS 5.0, you can "fool" them into executing properly by telling DOS 5.0 to lie about its version number with the new SETVER command.

The most disappointing aspect of DOS 5.0's SETUP program is that it makes almost no attempt to optimize the system's memory configuration on 80386 and 80486 hardware. Although SETUP looks for the existence of the HMA and adds the appropriate commands to CONFIG.SYS to load the DOS kernel into the HMA, it does not automatically configure EMM386 as a UMB

WHAT WILL BECOME OF DOS UTILITIES?

by Gus Venditto

DOS 5.0 has new features that many of us already have from utilities. This doesn't mean the end for most DOS utilities. It's really a step up.

By documenting a method for using high memory and by providing an applications program interface (API), Microsoft has handed creators a new set of opportunities.

Talks with retailers and analysts gave some clue as to what to expect.

For example, on-line help from the command line will become more common, thanks to the DOS 5.0 API. When you type HELP at the DOS prompt, many utilities will include their own commands along with DOS's.

The big opportunities will be in memory management.

The first opportunity is to automate the process of putting TSRs and device driv-

ers into high memory.

Another is to solve a limitation in many 386 PCs that prevents DOS from putting device drivers and programs in the memory between 640K and 1MB. The ROM-shadowing used by Compaq, AST, and Northgate in many of their machines stops DOS from using this RAM because all of it appears used, even though most is free. Memory managers need to find the free RAM and make it addressable to DOS.

Memory managers should also be able to squeeze more software into upper memory on other machines by analyzing the holes in the area between 640K and 1MB.

Another area where you'll see activity is in task switching. DOS 5.0 swaps programs to the hard disk, but you can use extended memory for this task. ■

provider; nor does it load TSRs and device drivers above the 640K boundary. Consequently, some users may be initially disappointed with DOS 5.0, finding that their memory situation did not improve very much.

The full benefits of DOS 5.0's support for UMBs can only be gained with careful study of the "Optimizing your System" chapter of the DOS 5.0 manual, close inspection of the output from the MEM command, and tweaking of the CONFIG.SYS and AUTOEXEC.BAT files.

The DOS 5.0 documentation has been telescoped into two

softcover manuals. A 56-page pamphlet titled *Getting Started* discusses the setup procedure, recovering from botched installations, and network compatibility. The 670-page *User's Guide and Reference* discusses the use of DOS at all levels of expertise and covers each command and Shell function both in a task-oriented section and in a command-oriented section.

DOS 5.0 is not the "Super DOS" you may have hoped for. The changes are evolutionary, not revolutionary; the improvements are incremental rather than radical. DOS 5.0 doesn't "break the 640K barrier" in any strict sense, and users of 80386- and 80486-based machines will not gain the full benefits of DOS 5.0 without a fair amount of experimentation and tuning of their CONFIG.SYS and AUTOEXEC.BAT files.

Most of DOS 5.0's new features should have been incorporated into DOS long ago. These features better represent Microsoft's atonement for past neglect

than an attempt to transform DOS into a state-of-the-art operating system.

On the other hand, DOS 5.0 has retained all of DOS's traditional virtues. It reverses DOS 4.0's trend toward buggyness and pudginess. It's simple to use, it's easily extended and customized with third-party TSRs and device drivers, and it performs well on even the lowliest 8088-based PC with one floppy disk drive. And DOS 5.0's compatibility with existing applications, drivers, utilities, and networks is excellent, thanks to Microsoft's aggressive year-long program of beta testing.

While DOS 5.0 doesn't represent a technological breakthrough, it's a solid product that brings many important facilities that were previously the province of third-party utilities.

The inclusion of a decent shell, a task swapper, a disk cache, an expanded memory emulator, a command line history and macro facility, a full-screen editor, UNDELETE and UNFORMAT raise the ante for vendors of utility packages, but may actually serve to expand the market for more powerful versions of those facilities as well.

The retail availability and reasonable price of the DOS 5.0 upgrade, the convenient new commands and features, and the safety net provided by the improved installation program are sure to entice a high proportion of the 50 million users of DOS versions 2, 3, and 4 to make the switch—and rightly so. ■



THE TOP FIVE NEW DOS COMMANDS

There are 70 commands and device drivers in DOS 5.0; 12 of them are new. Here is PC Magazine's pick of the top 5 new commands.

LOADHIGH	Installs a program in upper memory.
DEVICEHIGH	Installs a device driver in upper memory from CONFIG.SYS.
UNDELETE	Restores erased files.
EDIT	A full-screen text editor similar to the Windows Notepad.
HELP	Provides documentation on any command from the DOS prompt.



MS-DOS 5.0 Upgrade kit

Microsoft Corp., One Microsoft Way, Redmond, WA 98052; 206-882-8080.

List Price: Retail Upgrade, \$99.95; Master License Pack, \$79.95 per license (no documentation).

Requires: 512K RAM. Hard disk recommended; 2.8MB of free space needed for installation of full upgrade (includes space temporarily occupied by previously installed version of DOS).

In Short: A thorough, if long-overdue overhaul of the MS-DOS operating system with significant improvements to installation, memory utilization, and the user interface.

CIRCLE 700 ON READER SERVICE CARD

Requirements: IBM PC, XT, AT, PS/2 or compatible with 512Kb of RAM and a hard drive. HP LaserJet Plus, II, IIP, III, HP Deskjet or any LaserJet compatible laser printer. MS-DOS or PC-DOS version 3.0 or later. WordPerfect 5.0, 5.1 or later.

Once you've extend



**WITH OUR NEW SX MODELS, IBM MAXIMIZES
THE POWER OF THE INTEL 486 CHIP. AGAIN.**



When the IBM PS/2® Models 90 and 95 XP 486™ were introduced, they burst from the starting gate with incredible power, and have held their lead brilliantly. With the introduction of the new 20 MHz SX™ models, IBM offers lower-cost entries that deliver high-powered computing. So no matter how diverse your needs, we have a champion ready for you.

All the Models 90 and 95 are designed to use the most advanced components to achieve optimum balanced performance in power, speed, storage, memory and XGA graphic resolution. Like their forerunners, the new 90 and 95 XP SX models possess a 64-bit processor-to-RAM path and advanced Micro Channel™ 32-bit architecture for lightning-fast data flow and improved data integrity. The 4MB RAM standard on the SX models is doubled to 8MB on the 25 and



got a champion, the line.



33 MHz models, so
challenging hurdles like
multimedia are easily cleared. The 25
and 33 MHz models also include a math co-processor
for improved performance in numeric-intensive
applications like financial modeling and CAD/CAM.

But perhaps the most compelling feature of
today's champions is their ability to adapt to the needs
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processors with Micro Channel busmaster adapters.

So what you get is a machine with the kind of strength, flexi-
bility and staying power that makes a real champion.

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contact your IBM Authorized Remarketer or IBM marketing
representative. For a remarketer near you, call 1 800 272-3438.

How're you
going to do it?
PS/2 it!



First Looks

LOTUS

CONTINUED FROM PAGE 35

likely to be enhanced EMS support. Setting an optional global default switch enables the new version to store cell pointers in expanded memory, which means you can create much larger worksheets and databases. In Release 2.3, for example, you can use /Data Fill A1..J8192 without touching conventional memory; in Release 2.2, this operation produces an out-of-memory error, no matter how much EMS your system has.

Release 2.3 replaces the Spreadsheet Publishing add-in *Allways* with the much more capable utility WYSIWYG. WYSIWYG is the same add-in supplied with Release 3.1. (For a detailed description of WYSIWYG, see the review "1-2-3 Release 3.1: Graphic Improvements," February 12, 1991.) WYSIWYG's only drawback is that it eats about 100K of conventional memory (half again as much as *Allways*). Users who need publishing capability but can't afford that memory bite might prefer to stick with Re-

lease 2.2 and *Allways*.

As in Release 3.1, WYSIWYG's attachment presents users with parallel menu trees that partially overlap in functionality, but in Release 2.3 Lotus has done a better job of minimizing the complexity. The help system has been expanded, and the manuals have been reorganized to discuss WYSIWYG features alongside 1-2-3 features, rather than in a separate booklet.

More important, Release 2.2's setting sheets have been transformed into interactive dialog boxes. Users can now get to formatting, printing, and graph customization options, for example, without having to wander six levels into the menu tree.

Release 2.3 remains weak in the area of file linking, allowing you to work with only one file in memory at a time and permitting links only to single external cells. In this area, Lotus will continue to be vulnerable to *Quattro Pro* and *Microsoft Excel*.

But Release 2.3 offers a snazzy Viewer add-in, based on Lotus's *Magellan*. It lets you peek into worksheet and text files and build links just by pointing. The new Auditor add-in, meanwhile, lets you trace, highlight, or list on the worksheet the precedents and de-

A MODEST UPGRADE FOR 3.1

Lotus has announced 1-2-3, Release 3.1 Plus, an enhanced version of its three-dimensional spreadsheet for the extended-DOS environment.

When it ships later this summer, 3.1 Plus will feature a Solver add-in functionally identical to 1-2-3/G's (but with a command line interface instead of dialog boxes), along with the Auditor and Viewer add-ins that adorn Release 2.3. Like the Release 2 update, Release 3.1 Plus will carry a suggested retail upgrade price of \$150.

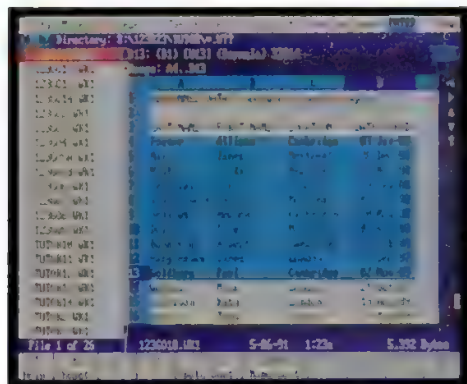
Combined with 3.1's three-dimensionality, superior file linking, and the ability to access external data tables via DataLens drivers, the Solver will help Lotus maintain an arguable distinction between the Release 2 and Release 3 product categories.

Release 2 will remain the classy hot rod for two-dimensional crunching; Release 3 will be pitched at users with advanced needs and large-memory systems. Underscore

the word large: The Solver will require 700K of extended memory just to come on-board (it can use virtual memory); putting the add-in to work on a real problem will require even more.

What isn't clear yet is how 1-2-3 for Windows will fit into the picture. At the time of the 2.3/3.1 Plus announcement, Lotus had no firm ship date or publicly announced feature list. Given the intense competition from Microsoft and Borland, though, it's a safe bet that 1-2-3 for Windows will include, at a minimum, all of Release 3's advanced capabilities.

Lotus has promised to maintain and support both DOS product categories into the far-off future, but it's possible that Release 3.x will be destined for an ever-shrinking niche market: advanced users with heavy-duty hardware who, for whatever reasons, are determined to resist the move toward graphical environments.—CS



Lotus 1-2-3, Release 2.3, uses *Magellan* viewer technology to let you browse 1-2-3, *Symphony*, and text files. It also lets you facilitate file linking.

Release 3.1 Plus includes a Solver much like the Solver in 1-2-3/G except that it uses a command line, not dialog boxes. The Solver imposes hefty memory requirements.



pendents of any formula. It'll also help you thread your way through a circular reference chain.

For macro writers, the only news is the addition of Release 3's {append}, {appendright}, {form}, and {formbreak} commands, all designed to facilitate database management. Release 2.2 macros will run unmodified in Release 2.3, despite the fact that Release 2.3 issues a confirmation prompt when you use /FR on an unsaved worksheet (the warning is suppressed if the /FR comes from a macro). The function library, unfortunately, is unchanged; the useful @INFO remains a Release 3-only function.

Also regrettable is the fact that 1-2-3, in its native mode, still provides no color customizing commands. To match WYSIWYG's defaults, the basic colors have been reversed—giving you

black characters on a white background.

Release 2.3 should be welcome news for Release 2.x users. While there's nothing revolutionary here, there are lots of inducements to justify the \$150 upgrade price.



FACT FILE

Lotus 1-2-3 for DOS, Release 2.3

Lotus Development Corp., 55 Cambridge Pkwy., Cambridge, MA 02142; 617-577-8500.

List Price: \$495; upgrades, \$150

Requires: 512K RAM (384K without WYSIWYG), hard disk, DOS 2.1 or later.

In Short: Release 2.3 adds Release 3.1's WYSIWYG publisher to the classic 1-2-3, along with *Magellan* file viewers, an auditing module, better charting, a mouse interface, and a host of other welcome improvements. The product's performance is essentially unchanged.

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After 20 Million Pages Of PostScript Color Output, The Last One Looks As Great As The First.



MacWorld World Class Award
September 1990

PC Magazine Editors Choice
November 14, 1989

recipient's tendency to act upon the information. So, in today's competitive business environment, the key question becomes, "Can we afford *not* to have the power of color?"

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If it's dynamic presentations you're after, you need the Model 10. From business presentations to training programs, the Model 10 delivers vibrant, visually exciting colors that help you communicate ideas clearly. QMS screen angling technology and special presentation inks make these unusually captivating colors possible. And it's a proven fact that color presentations increase audience information retention and raise a

The ColorScript Model 30i Printer, Strictly For The Image Conscious

Extremely low cost Pantone-approved proofs in about 60 seconds. If you're a graphic designer, commercial artist or publisher it's easy to see how the Model 30i is revolutionizing your business. The QMS ColorScript 100 Model 30i is changing the relationship between speed, quality and cost by allowing you to do your job faster, cheaper *and* better!

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True Adobe PostScript Guarantees Compatibility

Since Adobe introduced the PostScript page description language in 1984, it's become the industry standard for electronic printing and publishing. And

Features That Will Color Your Perception Of Business And Design Forever

- Compatible with Macintosh computers, IBM PC's and clones and other popular systems
- 35 resident Adobe PostScript typefaces all scalable and rotatable
- Model 30i has standard 8 MB RAM/1 MB ROM
- Model 10 has standard 5 MB RAM expandable to 8 MB RAM
- Model 10 prints letter- and legal-size paper and transparencies
- Model 30i prints letter-size and 11" x 17" paper and transparencies
- AppleTalk™/RS-422, RS-232 serial and Centronics® parallel interfaces provide compatibility with most micro, mini, mainframe and workstation hosts
- External SCSI interface supports up to seven additional hard drives of unlimited size
- 68020 MPU-based controller plus exclusive QMS ASAP™ technology means fast first-page-out performance
- Prints high-quality Adobe PostScript text and graphics at 300 x 300 dots per inch
- HP-GL® emulation software included

with the QMS ColorScript 100 Model 10 and Model 30i, you get guaranteed compatibility and consistency. PostScript imitations, on the other hand, may not be 100 percent compatible with Adobe's PostScript.

Two Top Performers Right Out Of The Box

Whether you choose the Model 10 or the Model 30i you can be up and running within minutes. Both printers are designed for maximum compatibility with Macintosh® computers, IBM® PC's and compatibles as well as many other systems. And, for additional support, QMS's technical and service professionals are standing by to assist you with answers that will get you up to speed fast. Call us today and we'll help you decide which printer best suits your needs. Or FAX QMS Product Information at (205) 633-4866.

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IBM's Hollywood: Stellar Presentations for Your PC Screen

HANDS ON
by Luisa Simone

Hollywood is more than just a town in southern California—it's a glamorous and glitzy state of mind. IBM is hoping that its new \$495 graphics program can live up to its namesake and make business presentations downright entertaining.

Hollywood excels at razzle-dazzle effects. Even nonartists can utilize pop-up dialog boxes to enhance text and graphics objects with rotations, shadows, or 3-D effects. The special text tool makes it easy to create headline art. Special formatting effects can be applied to the outlines of any installed Speedo Bitstream font (Dutch, Swiss, and ITC Zapf Dingbats are included). So wrapping text to a circle or applying a gradient fill to letters requires only a very few mouse clicks.

In the business world however, pretty pictures are no substitute for data-driven charts. And here too, *Hollywood*'s star shines. Formatting commands allow you to add drama to your word charts by automatically numbering items in a slide, instantaneously adding bullets to a list, or using the layering functions to create progressive builds for screen shows.

Hollywood can handle large data sets (400 data points per series and 24 series per chart), 3-D effects, and exploded pies. You can add considerable value to your charts by rendering multiple pie charts with proportional radii, or employing dual axes with both linear and logarithmic scales in one graph.

Managing the presentation information is a snap; all of *Hollywood*'s charts are dynamically linked to either its built-in Outliner or Data Manager.

You can type or import text (in ASCII, *DisplayWrite*, or *WordPerfect* formats) into the full-featured Outliner. Al-

though the Outliner displays text in the very same font and color that will appear in the presentation, the arbitrarily enlarged size of the outline text cannot be changed, making it quite difficult to speed type or judge true point size.

You can reorganize your presentation using the Outliner or a thumbnail miniatures view. And though speaker notes and handout pages are created automatically, I would love to see more diverse layout options.

The Data Manager is an internal spreadsheet. You can cut and paste cells from multiple spreadsheet sources. Warm links to the original *Microsoft Excel* or *Lotus 1-2-3* (.WK1 only!) files allow you to update information when you reopen a presentation. And because you highlight the data range you want graphed, one Data Manager file can be used to hold all the information for the different charts in your presentation.

Unfortunately, the power of the Outliner, Data Manager, and option boxes is offset by their rigidity. Like old DOS-based, form-driven graphics programs you must go back to

the Outliner, Data Manager, or option box in order to tweak any word or data chart.

Strict formatting rules control the behavior and appearance of objects. So you can use the color scheme dialog box to pick any colors, including gradient fills, for eight data series in your charts. But if you decide to graph more than eight series, the colors you've chosen simply repeat; there is no way to add more colors or to change colors for individual bars.

In addition, a single *Hollywood* presentation gets formatting information from a number of different—and sometimes conflicting—sources.

Interactive type styles control the look of your text. Color schemes map the colors of specific items (such as bullet or data charts) in your presentation, but they also carry the default type specifications for headlines and body copy. Templates include color schemes, but are basically used only to regulate object placement. Unfortunately, templates can only control the placement of objects created with the Data Manager or the Outliner. Other art ele-



FACT FILE

Hollywood

IBM Desktop Software, P.O. Box 2150, Atlanta, GA 30301-2150; 800-IBM-7699, (in Canada, call 800-465-1234).
List Price: \$495

Requires: 286-based PC, (386SX or better recommended), 2MB RAM, hard disk, DOS 3.3 or later. Windows 3.0, graphics adapter, mouse.

In Short: *Hollywood* provides easy-to-use tools for a broad range of presentation needs. High-end drawing tools, scalable Bitstream fonts, strong charting capabilities, and a great screen-show utility compensate for several annoying idiosyncrasies.

CIRCLE 701 ON READER SERVICE CARD

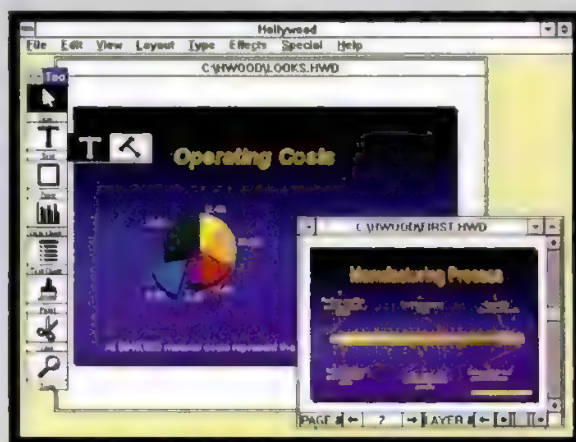
ments (clip art, rules, headline art) are ignored by templates unless they are placed on the Master background page.

Worst of all, though both color schemes and templates are optimized for specific output devices, neither can override settings in the *Windows* Control Panel, making it easy to mismatch a driver and a template. In short, IBM needs to streamline the formatting process.

The graphics import/export filters could be improved. Though *Hollywood* can import the full range of graphics files—including TIFF, CGM, and .WMF—it often creates disproportionate bounding boxes, which is not a serious problem until you try to resize or reposition a picture.

But even given these complications, *Hollywood* is too good to pass on. Unlike *Microsoft PowerPoint*, *Hollywood* utilizes high-quality, scalable typefaces in the form of Bitstream's Speedo technology. In addition, the program comes with clip art, a communications program for transmitting files to MAGICorp's slide service bureau, and a dynamite, runtime screen-show utility. The screen show's 16 different transition effects can either be applied to pages or to the individual layers of each slide for creating builds.

In short, *Hollywood* deserves a rapt audience and a round of applause. ■



Editable Bezier curves, three-tiered gradient fills, and grouping, locking, and layering functions made short work of this illustration.



Our Latest PostScript Printer Technology Impressed The Experts...



MacUser,
Editor's Choice Award
(Eddy), Jan. 9, 1991



PC/Computing,
Most Valuable
Product,
Nov. 1990



BYTE,
Editor's Product
Merit Award,
Jan. 1991



Personal Publishing,
1990 Outstanding
Achievement Award



POSTSCRIPT

QMS-PS 410, 815 & 825 PostScript Laser Printers

- ESP - Emulation Sensing Processor (printer interprets incoming printer language and switches automatically)
- SIO-Simultaneous Interface Operation (allows the printer to receive data from three interfaces simultaneously)
- LocalTalk, RS-232C serial and Centronics parallel interfaces (connects to IBM® PC's, Apple® Macintosh® computers and most mini computers and mainframes)
- 45 resident Adobe PostScript typefaces (all can be scaled from 4 points upward, rotatable, all with multilingual character sets)
- Front Panel Display on QMS-PS 815 & 825 (16-digit multilingual LCD array conveys printer status, allows user to quickly configure printer)
- Resident HP LaserJet Series IIP & PostScript emulations (prints PostScript & HP applications, HP-GL emulation cards available)
- QMS ASAP III Technology and 68020 Microprocessor (exclusive technology means fast first-page-out performance)
- PS Executive Series™ Utilities Software (to easily set printer parameters)

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Before we developed the QMS-PS® 410 four page-per-minute laser printer, we performed one very important task. We listened to what you wanted. Then we engineered a printer light years ahead of the rest with features that aren't available on other printers at any price.

And now, QMS brings you more of a good thing. The QMS-PS 815 and 825. Two eight page-per-minute laser printers with all the leading edge features of the 410 *plus* enhanced processing speed, an increased duty cycle and an easy-to-read, multilingual front panel that lets you quickly configure the printer to suit your specific needs.

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How did these printers capture the imagination of an entire industry? The answer is, quite literally, simple! These leading edge printers are so simple to operate they seem to "think for you." Each printer features ESP® (Emulation Sensing Processor) which allows them to interpret incoming data and automatically choose the appropriate printer language without changing switch settings or sending complicated software commands. And to make things still simpler, the 410, 815

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Whether you choose the 410, 815 or 825, you'll enjoy the desktop design flexibility of the latest version of Adobe® PostScript®. This most recent version includes the output enhancement of Adobe Type Manager™ (ATM). All printers come standard with 45 resident typefaces scalable from 4 points upward and fully rotatable. These PostScript printers guarantee compatibility with thousands of useful PostScript applications currently on the market.

For even greater flexibility, these printers feature standard HP® LaserJet® Series IIP emulation to support non-PostScript printing applications. And a variety of options makes the printers easily expandable. HP-GL®

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As a recognized leader in PostScript printer technology, QMS maintains a commitment to customer satisfaction by providing free, responsive technical support. And to keep your QMS printer operating at its peak, QMS National Service offers a variety of service options. Call us today and see how QMS quite simply makes the best PostScript laser printers in the world. Or FAX QMS Product Information at (205) 633-4866.

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*patent pending

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PHOTOGRAPHY: THOM O'CONNOR

The 11" x 17" PostScript Powerhouse

Just \$9995!



Features That Make The QMS-PS 2210 A True PostScript Powerhouse!

- Up to 11"x17" printing capability
- 22 pages per minute and QMS ASAP technology cuts waiting time
- 4 MB RAM builds complex pages quickly
- 39 resident Adobe PostScript typefaces
- HP LaserJet & HP-GL emulations for non-PostScript applications
- AppleTalk, RS-232 serial and Centronics parallel interfaces mean instant connectivity in practically all environments
- Choice of 350 or 600 sheet input capacity
- SCSI port allows connection of up to seven external hard drives for font caching and permanent storage of downloadable typefaces, emulations and PostScript programs
- PS Executive Series™ utility software allows each user to name, configure and align the printer as well as download fonts from the individual host computer

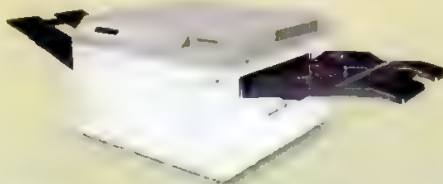
22 Pages Per Minute Give It The Best Price-To-Performance Ratio On The Market

It took QMS® to engineer a 22 page-per-minute PostScript® laser printer that stretches beyond the capabilities of other printers and *still costs less!* The QMS-PS® 2210 reaches beyond many others by giving you all popular paper sizes up to 11" x 17"/A3-size printing capability. And it surpasses others in print quality as well with laser-sharp fine line detail and rich saturated black fill areas. No more pale cut-and-paste newsletters, no more mismatched spread sheets, no more engineering and design projects held together with staples and tape! And the 2210 beats the competition price-wise, too, by delivering all this and more for just \$9995.

Perfect For The "Upscale" Network

The QMS-PS 2210 is perfect for a shared printer environment requiring high-quality 11"x17" output. Whether you use Macintosh® computers,

IBM®PC's /compatibles or most other mini computers and mainframes, you'll enjoy instant connectivity with AppleTalk®, RS-232 serial and Centronics® parallel interfaces. Should you require non-PostScript printing applications, the 2210 comes standard



with HP-GL® and HP® LaserJet® emulations. The 2210 also cuts waiting time with fast page processing made possible by QMS's exclusive ASAP™ (Advanced System Architecture for PostScript) technology and a 68020 microprocessor. That means fast first-

CIRCLE 141 ON READER SERVICE CARD

page-out performance. Add this to 350 sheet input capacity (600 sheets in the QMS-PS 2220) plus a 20,000 page-per-month duty cycle, and it's easy to see why the QMS-PS 2210 is a true network star!

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As a recognized leader in PostScript printer technology, QMS maintains a commitment to customer satisfaction by providing free, responsive technical support. And to keep your QMS printer operating at its peak, QMS National Service offers a variety of service options. Call us today and see how easy it is to put the true PostScript powerhouse to work for you. Or FAX QMS Product Information at (205) 633-4866.

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First Looks

Windows Accounting Packages Target Different Audiences



Windows brings a consistent and manageable interface to business accounting software—a genre that has a richly deserved reputation as being difficult to use.

Both *AccPac Simply for Windows*, from Computer Associates International, and *M.Y.O.B. for Windows* ("Mind Your Own Business"), from Teleware, originated on the Mac platform, and have both enjoyed great success. Both provide all the features you expect in a business accounting product, although *M.Y.O.B.* emphasizes the graphical user interface and is better suited for those just getting started. *AccPac*, while more of a plain Jane, is better suited to multiuser businesses.

Both packages' accounts payable modules track paid and unpaid vendor invoices and print checks. Both accounts receivable modules track paid and unpaid customer invoices and print invoices and statements. Both include inventory modules that provide detailed tracking of both inventory dollars (using weighted averages) and inventory units.

Both provide a general ledger for collecting the financial information necessary to prepare income statements and balance sheets, and for producing

The *M.Y.O.B.* Checkbook window organizes command icons with a flowchart—a helpful navigational tool.



those as well as other financial reports. Finally, they each provide simple job costing, letting you track revenues and expenses by job or project—as a general contractor might do.

Mechanically there are similarities, too. Both products update your accounting database as soon as you record transactions rather than forcing you to post transactions in batches. Both provide plentiful samples of accounts that can be modified. What's more, both separate accounting components into modules: general ledger, accounts receivable, accounts payable, and so on. In the *Windows* environment, this means you can flip between, say, the general ledger and accounts payable with a click of the mouse, with no loss of work.

Despite the similarities, however, the products are by no means identical.

AccPac, for example, handles payroll. The U.S. version calculates U.S. federal and state income tax, social security, Medicare, FUTA, SUTA, and SDI, and prints W-2s, 940s, and 941. (The Canadian version calculates Canadian federal and provincial payroll taxes and prepares T-4s and Relevés.)

M.Y.O.B. can print payroll checks via its check-printing feature, but it won't calculate deductions or print payroll forms or reports.

AccPac has more-sophisticated password levels. Within *AccPac*, you set a single systemwide password; you can also set three other function-specific passwords. Multiple passwords give you the ability to assign different users different system privileges. *M.Y.O.B.* has only a single, systemwide password.

M.Y.O.B. has its own strengths. One big plus is its checkbook program, which lets you use the checkbook to record income and expenses. Anytime you deposit money, for example, you record revenue. And anytime you write a check, you record an expense. The simplicity of *M.Y.O.B.*'s *Quicken*-like checkbook metaphor offers users who aren't quite ready for double-entry bookkeeping an easier entry point. Then later they could migrate to the full double-entry system. *AccPac* offers only double-entry bookkeeping.

M.Y.O.B.'s interface is also considerably more graphical. For example, *M.Y.O.B.* uses handsome flowcharts as menus, which means a user gets not only access to commands from each menu, but also insight as to the order in which the menu commands should be used. And *M.Y.O.B.*'s on-screen windows use more color, are more attractive, and more often resemble the paper business forms they replace. For example, an invoice window really looks like an invoice form.

M.Y.O.B. provides some other noteworthy features that *AccPac* lacks. *M.Y.O.B.* tracks purchases and prints purchase order forms—a feature that may be a requirement for businesses that buy things using formal purchase orders or that need to track unfilled orders for inventory. *M.Y.O.B.* produces graphical versions of your financial statements, which make using an income statement and a balance sheet all that much easier, particularly for nonfinancial types.

M.Y.O.B. includes a to-do list function giving businesses, in effect, an automated tickler file. The to-do list can be used to track bookkeeping tasks, like paying outstanding bills, and it can be used to track other nonfinancial tasks, like remembering to return phone calls.

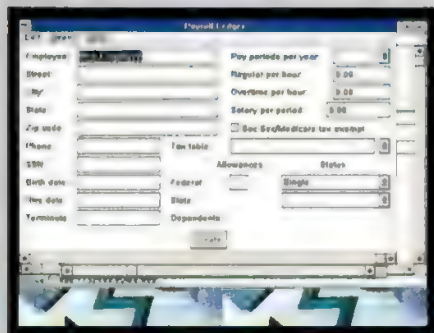
You won't go wrong with either package, but *M.Y.O.B.* has a clear advantage for those who value a truly graphical interface.

List Price: *AccPac Simply for Windows*, \$199. **Requires:** 1.5MB hard disk space; *Windows 3.0*. For *Windows*' Standard mode: 286-based PC or better, 1MB RAM. For *Windows*' Enhanced mode: 386-based PC or better, 2MB RAM. Computer Associates International, 1240 McKay Dr., San Jose, CA 95131; 800-531-5236, 408-432-1727.

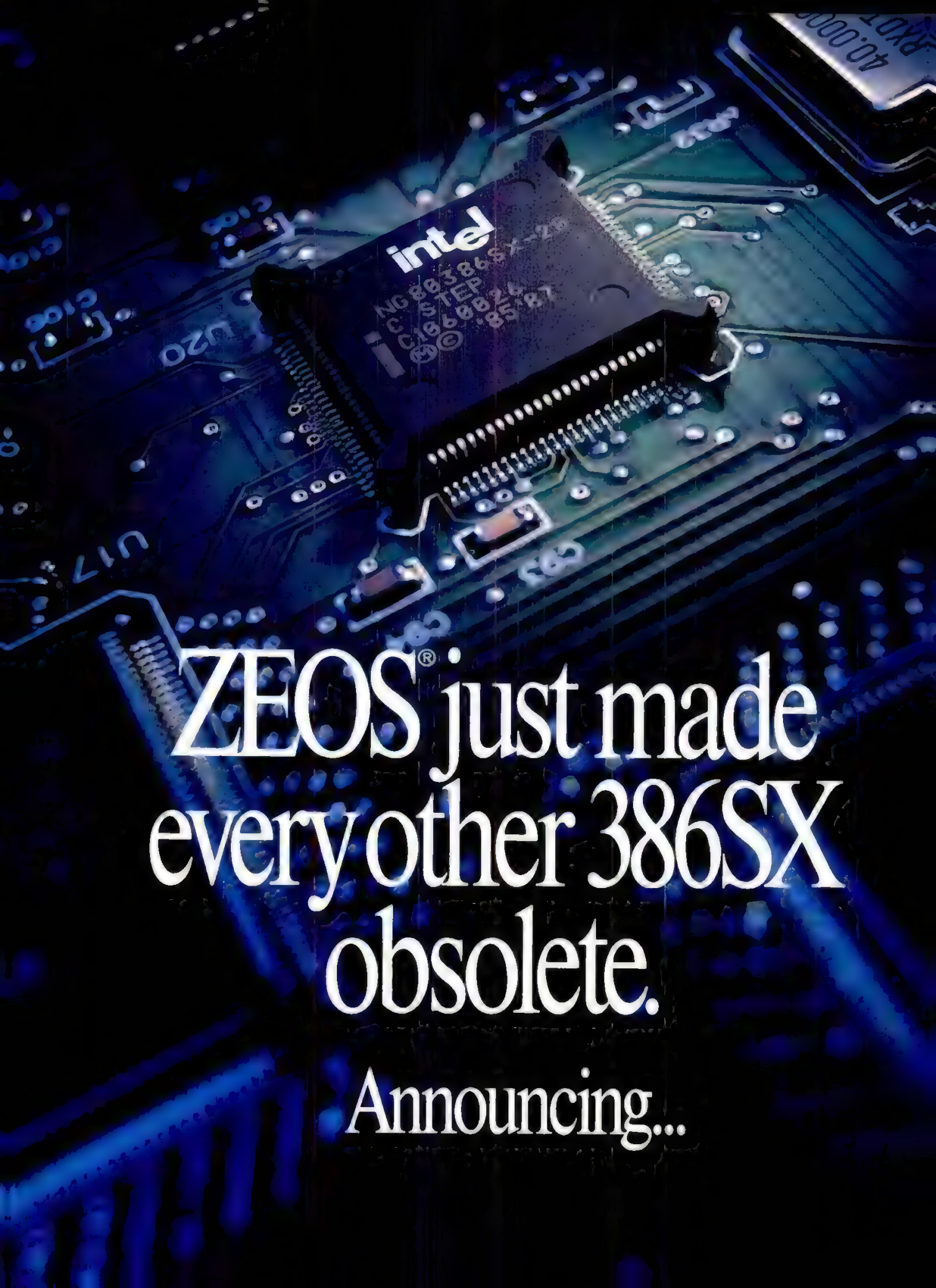
CIRCLE 448 ON READER SERVICE CARD

List Price: *M.Y.O.B. for Windows*, \$249. **Requires:** 286-based PC or better, 2MB hard disk space, *Windows 3.0*. Teleware, 300 Roundhill Dr., Rockaway, NJ 07866; 800-322-6962, 201-586-2200.

CIRCLE 449 ON READER SERVICE CARD



AccPac modules use simple and straightforward screens, as shown in this one for Payroll.

A close-up, high-angle photograph of an Intel 386SX microprocessor mounted on a green printed circuit board (PCB). The processor is a square chip with a black plastic package. The word "intel" is printed in white on the top of the chip. Below it, the text "NG80386SX-20" is visible, followed by "C STEP", "C1060026", and "© 1985". The PCB is densely packed with various electronic components, including resistors, capacitors, and other integrated circuits. The lighting is dramatic, with strong highlights and deep shadows, emphasizing the intricate details of the hardware.

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every other 386SX
obsolete.

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And starting complete at only \$1295,
there probably won't be for quite some time.
Come on in and take a look!

z. ZERO-WAIT S1295!

drive interface right on the motherboard. This not only saves you an expansion slot but enables us to provide you with the very latest (and fastest) IDE disk drives as well. Not only that, but your system will also accommodate additional hard drive technologies (including ESDI, SCSI, etc.) should you wish to add them. And your ZEOS Advanced Engineering Advantage

of pure clean power. This isn't some cheap power supply used to keep the price down—this is the *very best*. Because the very best is just what your system deserves. It deserves to live a long time too.

EXTRA COOLING. LONGER LIFE.

That's why you'll receive the unique *patent pending* ZEOS cooling system. This includes not just one but *two* whisper quiet cooling fans. Why two fans? Because we know that if, as an

Performance. Quality. Price. Support.

doesn't stop there.

On the I/O (Input/Output) side, we've freed up another slot for you too. We've taken the celebrated high speed ZEOS I/O card and put it right on the motherboard. The result is two fully software configurable *high speed* serial ports, the parallel port and even a game port *built right into* the motherboard!

ROOM TO EXPAND. POWER TOO.

If you should open up your system you'll see expansion room galore. Because at ZEOS, we always give you room to grow. That isn't just limited to more open expansion slots either. We give you our SpaceSaver case which has *seven* drive bays *yet is smaller* than most full size cases that have only five drive bays. But what of expansion *power*?

Having the room to expand is only part of the story, we give you the *power* to expand as well! Your new ZEOS 386SX-20 will have the best power supply money can buy and this baby will be pumping your system with a full 200 WATTS

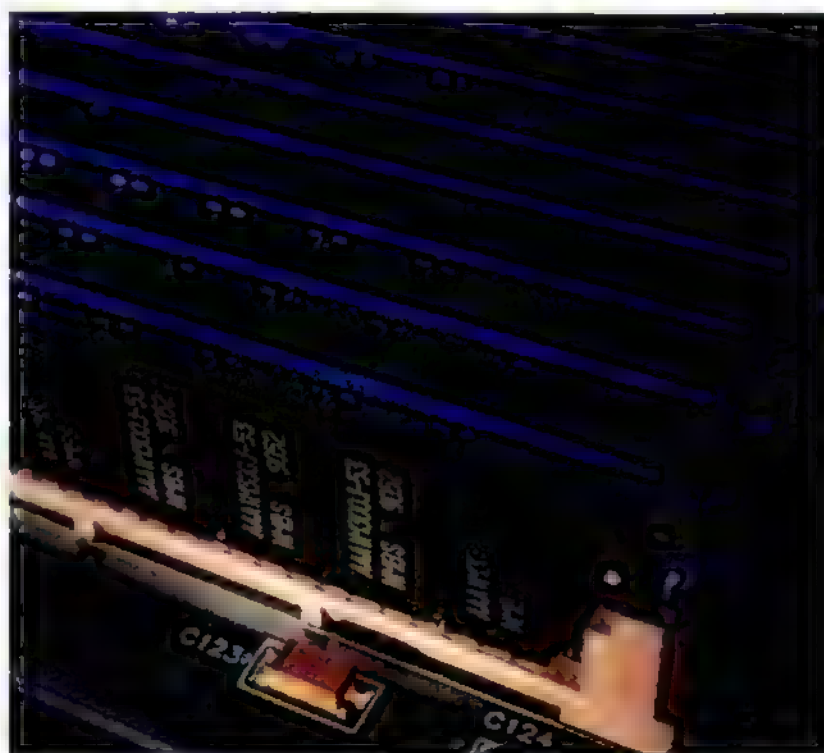
example, you lower the ambient interior temperature of your system by 10°C, you can up to double the life of the components inside! Now that's quality. Others don't do it. We do, because at ZEOS providing you with absolute quality and reliability are of primary importance. It's a case of quality. Speaking of which...

The beauty of your ZEOS case is much more than skin deep. The steel ZEOS uses is specified to be 0.20mm thicker than that of cases used by many of our competitors. And the fit is finely crafted to provide a rock solid system while meeting the stringent requirements of our Underwriters Laboratories listings. True, quality touches cost a *little* more but it all adds up to *value*, and *value* is why you're buying a ZEOS system!

Here we have discussed how your new ZEOS 386SX-20 provides you with stellar performance, unequalled quality and absolute reliability. With all of this, what more could there be? From ZEOS lots more.

Your ZEOS 386SX-20!

INCREDIBLY FAST 53ns DRAM



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Like ZEOS 24 Hour a Day Toll Free Technical Support. Most of our competitors still offer only part time technical support. Yet for the last two years ZEOS technicians have been standing watch for our customers—twenty-four hours a day, 365 days a year. We are *always* here for you, or anyone else using your ZEOS system, *any time* of the day or night.

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Setting the pace for the industry in performance, in quality and reliability, and in service as well guarantees that when you buy from ZEOS, you are buying the *very best*. Perhaps that's why, in their service and reliability issue, *PC Magazine* discovered that ZEOS 386SX systems were rated #1 by customers. #1 in technical support, #1 in repair services, #1 in customers who would buy again!

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☒ Friendly ZEOS Systems Consultants are available 24 Hours a Day by calling 800-423-5891. You can call any time.

When you add it all up, there's nothing like buying from ZEOS. There is certainly nothing like the incredible ZEOS 386SX-20!

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☒ Incredibly fast *53 nanosecond* DRAM giving true Zero Wait State performance. Your *entire* memory is like one huge cache, operating flat out at full processor speed.

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- Screaming ZEOS 20MHz 386SX motherboard.
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- Top quality 16-bit high res 1024 VGA color graphics card.
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PC Magazine readers rated ZEOS 386SX systems #1!

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#1 In Repair Services

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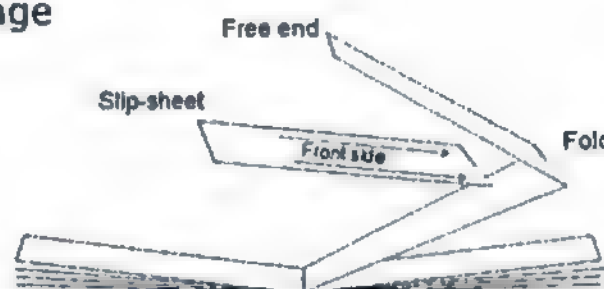
Inverted Foldout slip-sheet



GbsSlipSheet-001

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2. Insert this sheet with
 1. Front side touching the free page
 2. Arrow pointing to the fold
3. Slice the folded edge
4. Close the page and slip-sheet



Folded edge of the page

1. Open the foldout page

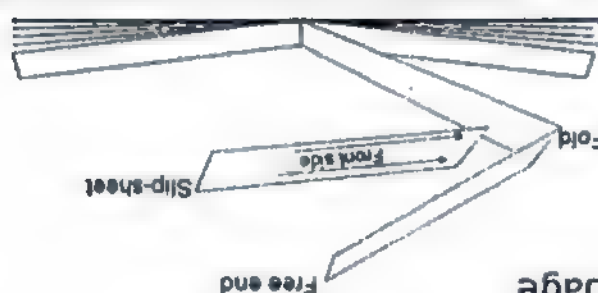
2. Insert this sheet with

1. Front side touching the free page

2. Arrow pointing to the fold

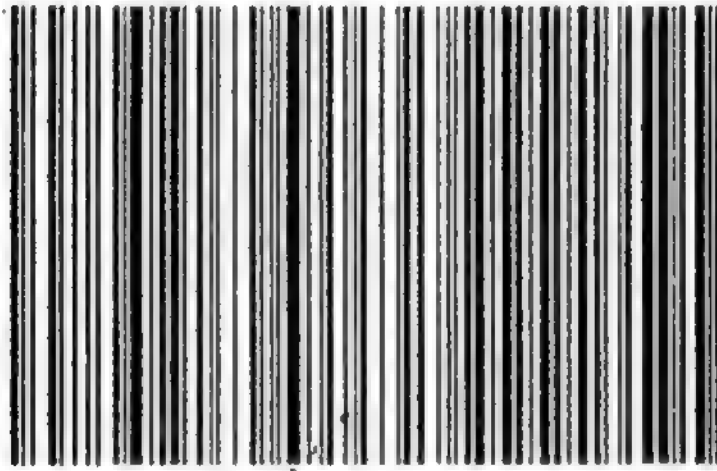
3. Slice the folded edge

4. Close the page and slip-sheet



1. Follow instructions on the other side

Inverted Back



GbsSlipBack-001B

Back

1. Follow instructions on the other side



That's right! Now you can own the incredible ZEOS 386SX-20 for as little as \$1295. And this is no ordinary computer.

Should you decide to purchase it (and we think you will), you will be acquiring the most advanced personal computer system of its kind. Incorporating the very latest in personal computer technology, your new ZEOS 386SX-20 is quite simply the very best you can buy—at any price. Why?

Pe

FAST MEMORY. INCREDIBLE PERFORMANCE.

For starters, we're including incredibly fast *fifty-three nano-second* DRAM. When we sat down to design this system we polled all the existing technology. We knew that while every 20MHz 386SX processor crunches data at the same rate, making that data available to the processor for immediate crunching is the key. The faster the DRAM (the computer's memory that holds the data for crunching), the faster the data got crunching.

Until now, the best way to get data to a 20MHz processor was to use "cache memory"; the next best is called page/interleaving. Yet a typical cache scheme of say 32K (only 1/16 of a megabyte) holds only a fraction of the memory's data for quick crunching by the processor. The rest of the system's memory is usually only 80 nanosecond (ns) or even slower 100ns DRAM. That's where ZEOS' blazing *53ns memory* comes in.

With the 53 nanosecond memory in your new ZEOS 386SX-20, your system's processor has *instant access* to all the memory in your system—not just a tiny fraction of it. This instant access to *all* your system's memory means your data is available for immediate crunching with absolutely no waiting! Bottom line—an *incredibly* fast computer.

INCREDIBLY FAST. JUST FOR STARTERS!

Incredibly fast indeed! Yet that's only the start of your new high technology ZEOS 386SX system. We've captured the latest in other technologies as well. Take hard drives for instance.

Your new high speed ZEOS 386SX-20 system includes our IDE hard drive interface and floppy

10 Good Reasons To Buy From ZEOS®

Reason #1 "Overall Excellence"

As *PC Magazine* said "Price is always a consideration. So are benchmark test results. But both factors can be deceiving, which is why we consider them in the context of other aspects that will make the difference months and years down the road."

These are the attributes which *PC Magazine* used in awarding ZEOS the coveted Editor's Choice, not once but seven times. And "Overall Excellence" are the very words *PC Magazine* used in describing ZEOS systems comparing them to all others.

Reason #2

Dazzling Performance.

In one recent '386 review, *PC Magazine* awarded ZEOS Editor's Choice. "The ZEOS '386 blows away every other computer... a smart choice" is what they said. And in another recent review, *Government Computer News* said the ZEOS 33MHz '386 is "arguably the fastest MS-DOS and OS/2 micro in the world."

Dazzling Performance is built into every ZEOS system. It's a key component of ZEOS Overall Excellence.

Reason #3

Exceptional Quality.

PC Resource Magazine put it this way, "ZEOS... provides quality comparable with IBM or Compaq and does so for about 70% of the price." ZEOS uses only the very best components. And every system is fully tested and burned-in right in our own labs.

Reason #4

Value.

InfoWorld says, "We find the ZEOS '386 an excellent value. Speed: Excellent. Compatibility: Excellent.

Value: Excellent."

Personal Computing said, "ZEOS... is the best value we've come across... its performance is right up there with the slickest, most expensive PCs you can buy."

Reason #5

Warranties and Guarantees.

ZEOS believes in its products. That's why we offer each and every customer our 30 Day Absolute Satisfaction Money Back Guarantee, no questions asked. Plus, our One Full Year Limited Warranty and Express Parts Replacement Policy. Optional On Site Service is available too. Call for details.

Reason #6

24 Hour Toll Free Technical and Sales Support.

At ZEOS, the customer is #1. That's why we invented 24 Hour a Day Tech Support. For *your* convenience. If you buy a product from us we feel we should be there to help, any time of the day or night. Give us a call Toll Free! 800-423-5891. Anytime!

Reason #7

Experience.

Almost unique in the mail order computer industry, ZEOS maintains its own chip level Research and Development staff. In addition to Systems Manufacturing, we also operate our own Board Level Manufacturing facility.

ZEOS has been involved in Research and Development since our incorporation back in 1981. Our strong and experienced Research, Manufacturing and Technical Staff translates into superior factory direct computer systems for you.

Reason #8

A Sterling Reputation.

In magazine after magazine and review after review ZEOS systems are cited for Overall Excellence, for Excellent Value, as the Right Choice and so on. All of this is flattering but the most important thing is this: What do our customers think? Frankly, they love us. The systems and the support. That means more to us than anything.

Reason #9

Easy to Buy.

ZEOS systems are easy to buy. You can pick up the phone any time of the day or night and order your new ZEOS computer. And we accept MasterCard, Visa, Discover, American Express, and Corporate Purchase Orders from Fortune 1000 Companies, Colleges, Universities and Governments. Complete Leasing Programs are available as well.

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Reason #10

You're Going to be Very Satisfied.

When it comes right down to it, you're going to be very satisfied with your new ZEOS system. Our goal is your complete satisfaction. And that's our commitment to you. To quality. To performance. To reliability and support. To *Value*. We don't just say it, *we Guarantee it!*

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First Looks

Windows cc:Mail Shines at Multiple Document Handling

HANDS ON
by Sara Parker

cc:Mail, one of the most popular e-mail programs, has made the transition to *Windows* in fine style. Its powerful e-mail management features, rich gateways to other e-mail packages, strong management tools, and full technical support are all intact.

cc:Mail for Windows is a complete store-and-forward messaging system that uses distributed applications running on networked PCs to access a common database of messages and user information. Each database, referred to as a "post office," is actually a set of files on a network file server.

cc:Mail's post office stores messages with pointers that direct them to the appropriate mailboxes. You can have multiple mailboxes (60,000 plus in theory, though 50 to 100 is more realistic) for every post office and any number of post offices per file server.

Through *cc:Mail* you can address messages to people on the local network, on distant LANs, and to people who receive mail through fax machines and even the postal service. You can also address and send messages to both public and private mailing lists, as well as to bulletin boards. Public mailing lists are created by the *cc:Mail* administrator; private mailing lists are created by individuals; bulletin boards are public forums available to everyone on the network.

The *Windows* interface makes it easy to create, read, and manage electronic mail. To create a message you click on the Prepare icon, and then on the Menu Selection Address. The *cc:Mail* directory appears, posting a list of your Mail Directory entries. Each entry can contain up to three items, including either the name of a user or of another *cc:Mail* post of-

fice, a user/post office status code, and optional comments.

Because *cc:Mail* takes full advantage of *Window's* MDI (Multiple Document Interface), you can have multiple windows open simultaneously within the application. MDI allows *cc:Mail* to manipulate multiple messages and mailing lists, draft text on-screen, and move the information from one window to another, without having to close any on-screen window.

For example, you might compose a message in one window, while using a second on-screen window to display the mailing list. All you need to do to send a message is click on a name in the list, and drag it over to add it to any field in the draft message. Creating an attachment is as simple as dragging a file icon to a message. You can attach text, graphics, or application files.

Notify—a built-in utility—looks for incoming e-mail and alerts you to the presence of a message with either a flashing icon or an alert window that displays your name and the number of messages waiting in your inbox. An audio alarm is also an option. You can choose how

frequently you want Notify to poll your mailbox for messages; it can also poll messages in the background.

cc:Mail's text editor is quite similar to *Windows* Notepad with added word-wrap and font capabilities.

System administration capabilities include setting up security, adding paths for remote users, and deleting old messages. The maintenance of directories through automatic directory exchange (ADE) is very efficient because after you update one post office or bulletin board on your network, the others are automatically updated, saving the administrator valuable time and effort.

Security options are plentiful. A password is required to log on, but if you can settle for a relaxed form of security, you have the option of adding a password to your own WIN.INI file so you'll be logged on automatically. Other security options include password expiration, user lockout, and password echoing.

cc:Mail operates on all major local area networks, and a number of platforms, including *Windows*, MS-DOS, the Mac-

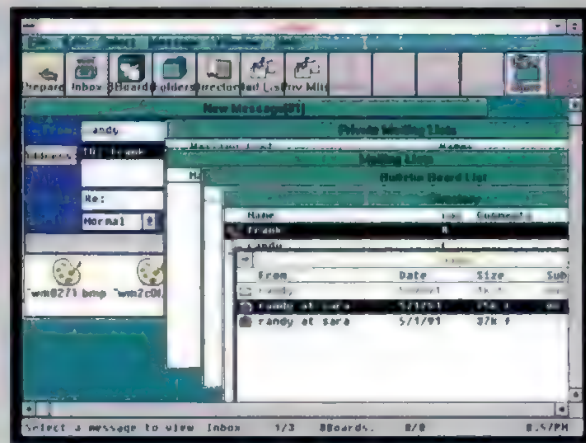
intosh OS, and OS/2. These versions of *cc:Mail* are purchased separately, but they all share a common set of operations.

cc:Mail can also connect to mini- and mainframe computers' e-mail services, and offers gateways to public e-mail services such as MCI Mail and CompuServe. The program also lets you send and receive Group 3 faxes, and allows you to view a received fax. Connecting to other messaging systems is relatively trivial since *cc:Mail* includes full support of Message Handling Service (MHS).

cc:Mail has a number of optional programs. The forthcoming *cc:Mail Remote* (*Windows* version), lets you call a *cc:Mail* post office from laptops or standalone workstations at remote sites.

cc:Mail is not the only e-mail product available for *Windows*. *Da Vinci eMail for Windows* from Da Vinci Systems also offers an e-mail package that is considerably less expensive. Priced at \$1,145 per server for 100 users, *Da Vinci* has been available for *Windows* since 1987; it also runs on DOS and OS/2 platforms.

Da Vinci incorporates DDE (dynamic data exchange); *cc:Mail* does not, although *cc:Mail* Inc. plans to incorporate DDE as well as OLE (object linking and embedding) by the end of 1991. *Da Vinci* Systems, on the other hand, has no plans to incorporate MDI in its e-mail product.



cc:Mail for Windows's use of multiple documents is a big help in managing network correspondence.



FACT FILE

cc:Mail for Windows
cc:Mail Inc., 2141 Landings Dr.,
Mountain View, CA 94043; 800-
448-2500.

List Price: *cc:Mail, Windows Platform Pack*, \$495; eight users, \$195 extra; 25 users, \$595 extra.

Requires: 2MB RAM, at least 2MB hard disk space on the network, *Windows* 3.0 or later.

In Short: The *Windows* implementation of *cc:Mail* includes MDI support, which makes it easy to work with multiple messaging windows.

CIRCLE 498 ON READER SERVICE CARD

First Looks

Edit Videos via Serial Port: NEC VCR Obeys Software Commands

HANDS ON
by Dave Huxford

NEC's \$2,100 PC-VCR elegantly combines VHS-video and computer control.

In addition to the standard video and audio input and output, this full-featured, option-laden 4-head stereo S-VHS VCR has an added serial port. The serial interface connects the VCR to any PC, so the PC system can manage nearly every command, option, and status code available to the VCR.

When you play a tape through the PC-VCR, the machine adds a proprietary hidden frame code. Automatic, accurate tape positioning is the most important benefit. Using the PC-VCR's random-access capability, you can command the PC-VCR to display or record any portion of a VHS or S-VHS tape (up to 8 hours).

With the right software, such as NEC's newly introduced \$299 *Video Scene Master*, a PC plus the PC-VCR can be used for computer-controlled video presentations, video editing, and interactive instruction.

Unlike several other recently announced, moderately priced



The PC-VCR has all the bells and whistles of a top-of-the-line unit, plus a serial interface for PC control.

video units with computer interfaces, the PC-VCR writes frame code directly onto the tape, so you can insert or remove tapes without losing positioning information. Through a patented process, the codes interleave with the normal video-head synchronization pulses, allowing the codes to be written before, during, or after recording the normal video or audio information.

In addition to setting the tape position, instructions from the computer can tell the PC-VCR to generate and overlay simple character titles over video, switch the tuner to any channel, select slow motion and pause

modes, change audio volume, and even turn on and off an auxiliary power outlet on the back panel. This can be quite useful for controlling a slide projector or a monitor.

Any software package that can communicate through the serial port at 1,200 bits per second can be used to control the PC-VCR. NEC supplies some simple demonstration control software in *ToolBook* format coupled with an extensive, if sometimes confusing, manual listing more than three-dozen commands and status messages. The *ToolBook* routines are sufficient for assembling a simple presentation, but are meant more as a resource and example for end-user programmers.

NEC's newly announced *Video Scene Master* offers a much more rigorous interface for full-blown video editing. The *Windows 3.0*-based program allows you to control two PC-VCRs to create scene lists and reassemble them into edit lists. Once the edit list is completed, the software does an automatic linear assembly of the scenes from one PC-VCR to the other.

As with all S-VHS or VHS recordings, your final product may not be "broadcast quality," and images get muddy after very few generations of copying. But if you work with competently shot S-VHS mode

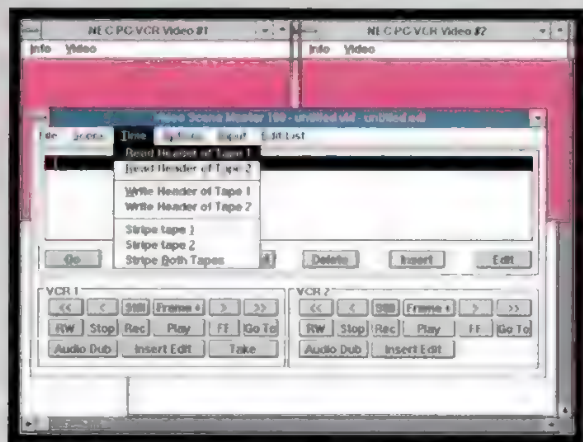
sequences, first-generation footage can look stunning on a good video monitor.

However, the PC-VCR is too slow to be a drop-in replacement for more-costly recordable laserdisk machines. Nor is the PC-VCR as nimble as an industrial- or professional-grade videotape machine that uses industry-standard SMPTE time code for positioning. Such machines offer better-quality video, but cost from \$7,500 to \$75,000.

With a tape travel and search time of up to 3 minutes, finding an image on the other end of a standard T-120 tape is far from instantaneous. The inherent slack in the VHS mechanism means that it may be a frame off in positioning and up to 20 frames off when starting to record. But the effect of any record delay can be minimized by using proper software.

Note, too, that the serial link between the PC and the PC-VCR carries only command and status information, not video images. If you want to merge the video output from the VCR with graphics on the PC screen or record PC video output on tape, you need additional hardware such as a videographics card with genlocking (image synchronization).

Still, for those who can accept the industrial-grade signal, and positioning that is slower than high-end hardware, the PC-VCR should be useful in small-scale desktop editing and multimedia presentations. ■



Software such as *Video Scene Master* lets the PC-VCR become a full-blown videotape editing machine.



FACT FILE

PC-VCR

NEC Technologies Inc.,
Professional Systems Division,
1255 Michael Dr., Wood Dale,
IL 60191-1094; 800-366-3632,
708-860-0335

List Price: \$2,100.

Requires: PC with available serial port.

In Short: The PC-VCR is a fully rigged video cassette recorder that communicates with your PC via a serial port. Slower than a laserdisk, but less expensive than professional SMPTE-based units, the PC-VCR should find a niche in video editing and presentations.

CIRCLE 447 ON READER SERVICE CARD

QUICK, NAME THE WORLD'S BEST MEMORY MANAGER:

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Editor's Choice Award!

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And when it comes to memory management, PC Magazine picked NETROOM over QEMM and all the rest.

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Relocates to High-DOS	✓	✓	✓
Relocates to LIM 3.2 Frame	✓	✓	✓
Relocates to Expanded	✓	✓	✓
Relocates to Extended	✓	✓	✓
Works on 386/486	✓	✓	✓
Works on 8088/286	✓	✓	✓
Memory Analysis Utility	✓	✓	✓

*Requires NEAT CHIPSet on 286 systems.

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☐ 1 user \$79.*5 s&h ☐ 4 user \$149.*5 s&h

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☐ Check ☐ MC ☐ Visa Exp. _____

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NYS res. add 8 1/4% sales tax. Allow 2-4 weeks for delivery.

**HELIX SOFTWARE
COMPANY**

To support all of NETROOM's features on 8088/286 PCs you will need NEAT CHIPSet or expanded memory hardware.

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First Looks

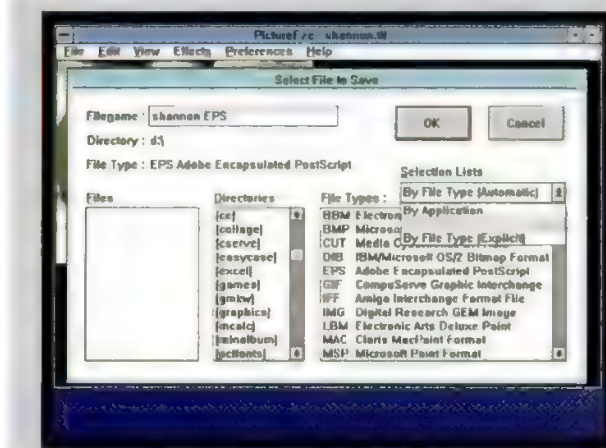
PictureEze Simplifies Graphics Conversions

HANDS ON
by James Karney

Converting graphics file formats will never be considered fun, but *PictureEze* from Application Techniques adds some intelligence to the process to make things easier.

The \$149 program imports images in any one of 20 formats or brings them in via the Windows Clipboard; it also offers basic image-processing features and a few special effects. Unlike most conversion programs, *PictureEze* insulates you from knowing the file format your target application requires; you simply specify the name of the application. It automatically selects the optimal file format and performs the necessary conversion. There are 65 applications to choose from, ranging from *Ami Pro* to *Xerox Presents*.

PictureEze converts between 18 different file formats, including .BBM, .BMP, .CUT,



In addition to image conversion, *PictureEze* offers simple image processing and preview functions.

.EPS, .GIF, .IMG, .IFF, .MAC, .TGA, TIFF, and .PCX. Among the extensive list of conversion options are 17 variations of the TIFF format alone.

If you prefer to work directly with file extensions you can. In

its most automatic mode, *PictureEze* chooses the optimal way to compress the file and handle color. A more manual mode, called Explicit mode, gives you complete control over the number of colors or shades,

and type of compression used.

You can also use *PictureEze* to perform color reductions. Other color-handling options let you specify whether to match, dither, or diffuse the palette in the newly created file.

Image processing effects include controls to adjust contrast, brightness, image size, and cropping. A dialog box uses thumbnail images to preview the effects of mirror, flip, and rotate options. A macro feature automatically records up to 32 commands that can be named and replayed on another file. An Undo feature lets you recover from mistakes, View allows zooming in a portion of the image, and an information box supplies a summary of the file type, size, and color-level reduction method.

PictureEze is a well-designed file-conversion tool with good color handling and some extra features that make it an excellent addition to a graphics software library.

List Price: *PictureEze*, Version 1.0, \$149. **Requires:** Windows 3.0. Application Techniques Inc., 10 Lomar Park Dr., Pepperell, MA 01463; 508-433-5201.

CIRCLE 446 ON READER SERVICE CARD

\$50 Spreadsheet Has Backsolver, Runs as TSR

HANDS ON
by Craig Severin

InstaCalc 3 is a completely rewritten update of *InstaCalc*, a TSR spreadsheet program that won Editors' Choice honors in 1988. The new version expands the worksheet to 256 by 4,096 and adds direct import of .WK1, .DBF, and ASCII files.

Other new features of *InstaCalc 3* include database entry forms, a goalseeking (Backsolver) command, 40 new functions, a macro recorder and debugger, an expanded macro vocabulary, improved graphics (including high-low charts), cell protection, matrix math, EMS support, a 43-line EGA/VGA display option, search-and-replace, a frequency distribution command, file encryption, worksheet file linking, and

a full-blown file manager (comparable with *Quattro Pro*'s). The program also now includes an intelligently designed mouse interface.

All this comes at a suggested price of \$49 via shareware channels, making *InstaCalc* a worthy competitor to other low-cost spreadsheet offerings, such as Computer Associates' *SuperCalc 5* (\$149) and Borland's original *Quattro* (\$99.95).

InstaCalc lacks *SuperCalc*'s three-dimensional capability and some of *SuperCalc*'s more exotic graph types (polar charts, for example), but its cascading menu tree and mouse interface make it considerably easier to learn. *Quattro* recalculates faster and offers big-company support, but it lacks a number of *InstaCalc*'s advanced features.

Price point aside, *Insta-*

Calc's most compelling attraction is its ability to be popped up from within any other DOS text-mode application. You can run the program either as a stand-alone spreadsheet or as a TSR. In the latter form, it claims about 13K of memory and waits for you to press a hotkey.

Pressing /Q sends you back to your calling application, and typing INSTA /U at the DOS prompt removes *InstaCalc* from memory. (Unfortunately, the program does not protect you from abandoning unsaved work when you uninstall.) You get about 37K of conventional memory for your worksheet in the default TSR mode, but a command line parameter lets you increase that to whatever your system will allow.

Moving data in and out of an *InstaCalc* worksheet is quite simple. *InstaCalc* enables you to define any rectangular block on the current screen and parses the incoming data as it would an

ASCII import. Leading spaces and tabs are trimmed, and anything ambiguous is treated as a label. *InstaCalc* does not have a Parse command, however, so you'll want to make your data unambiguous before transferring it.

InstaCalc stores macros in separate files, so you can call them up from any worksheet. Unfortunately, it does not translate macros created in 1-2-3.

InstaCalc won't send Lotus stock a-tumbling or retard the general migration of spreadsheet users into graphical environments. But it's an extremely attractive option for the non-Windows user who is in need of a spreadsheet with data-transfer capability.

List Price: *InstaCalc 3*, \$49. **Requires:** 512K RAM, DOS 3.0 or later; hard disk for TSR mode. FormalSoft, P.O. Box 1913, Sandy, UT 84091; 801-565-0971.

CIRCLE 446 ON READER SERVICE CARD

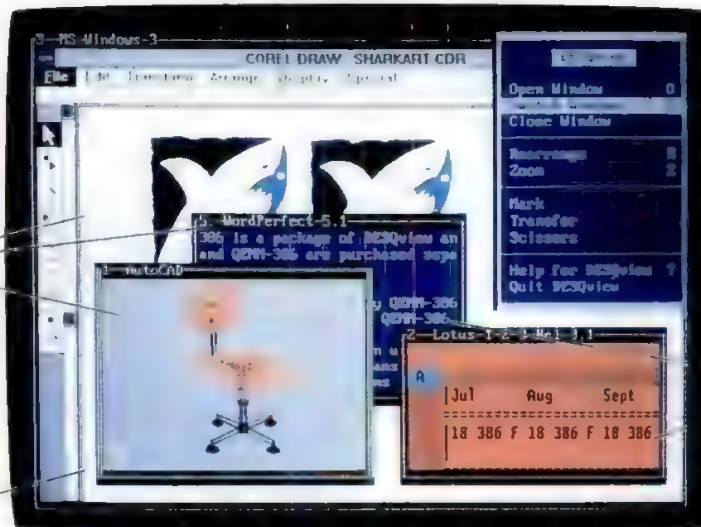
Better Windows

Solve memory problems
QEMM 386 makes the most of every last 'K'. DESQview uses that memory to run multiple programs.

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Run multiple programs side-by-side in windows. 'Background' programs can continue to run

See text and graphics side-by-side
Reference information in your graphics program while writing your report

Run Windows programs
DESQview even lets you run Microsoft Windows



Easy menu access to programs and DOS services
Access programs or DOS in a window with just a few keystrokes or mouse clicks. It's that simple.

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If your programs allow it, DESQview lets you run the same program in two or more windows. Great for comparing files

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Run standard DOS programs side-by-side with DOS-extended programs like 1-2-3 Release 3.

DESQview. The Multitasking, Windowing Environment.

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DESQview 386 2.3 lets you use your favorite DOS and DOS-extended programs in windows side-by-side on 386SX, 80386 and i486 PCs. As you can see above, you can even run Microsoft Windows

PC WORLD
Product of the Year
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PC Computing
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within DESQview.

DESQview 2.3 gives 8088, 8086 and 286 PCs with additional memory most of the same capabilities with surprisingly little performance trade-off.

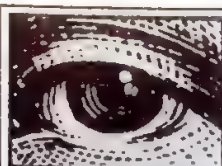
Whatever programs you use—DOS, extended DOS or Windows—and whatever hardware you have, whether 8088 or i486 or something in between, DESQview is still the best way to get the most out of the hardware and software you own today.

DESQview. When you look into it, it's the obvious choice.

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CIRCLE 338 ON READER SERVICE CARD



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typefaces save

you time because what you see on
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will look right the first time you print!



FUN.

Have fun with
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to express your

ideas boldly, elegantly, or even play-
fully. When documents look this good
and this professional, so will you.



EASY.

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creating docu-
ments that look
professionally

published is as easy as clicking a
mouse.

WYSIWYG

What you **see** is what you get

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URW Sans

Superb

URW Mono

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THE CRITICS CHOICE

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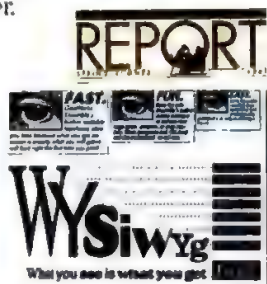
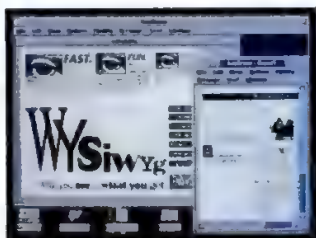
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- Best Creativity/Production
- Best Consumer Product
- Best New Use of a Computer

Ensemble Redefines PC Performance

Until now, the only way to improve PC performance was to buy new hardware. Not any more. Introducing GeoWorks Ensemble™ seven productivity applications integrated in an amazing graphical windowing environment called PC/GEOS™. Software so incredibly small and fast, it will run rings around any other graphical environment. And all on the PC you already own.

Take the documents above. They were produced on a

standard dot-matrix printer using GeoWrite™ and GeoDraw™ two of the applications included in the Ensemble package. Ensemble combines outline fonts and device independent graphics to deliver true WYSIWYG (What You See Is What You Get) on-screen and on your printer.



Any printer. From dot-matrix to laser.

With Ensemble, text can be smoothly scaled from 4 pt. (1/6th inch) to 72 pt. (1 1/2 inch high characters). Additionally, text and graphics can be stretched to any size or rotated to any angle. And Ensemble is precisely tuned to the maximum printing resolution of over 350 printers, so chances are you'll be producing dazzling typeset-looking documents in minutes.

Better still, you can keep right on working while you print. Ensemble's multi-tasking system lets you start the

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(WYSIWYG) ON-SCREEN AND ON PAPER
WITH ANY PC, AND ANY PRINTER.**

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...A technically impressive product regardless of hardware platform. [GeoWorks] Ensemble provides snappy performance on any hard disk-equipped PC, even an 8088.

PC Computing

[GeoWorks] has produced a GUI capable of making the PC a more friendly and powerful creature to the millions of people Windows and OS/2 have left behind...

FIRST LOOKS, PC Magazine

[PC/GEOS] thrives in a 640K 286, and even performs respectably on an 8088. On a run-of-the-mill 386, [PC/GEOS] performs crisply in a way that Windows only dreams of...

PC Magazine

GeoWorks PC/GEOS: What Windows 3.0 Should Have Been.

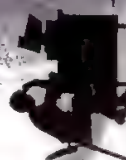
INFO WORLD

The Geos environment sports a simplified (but sharper-looking) Windows-like interface with many of the same features, comes with Ensemble (a bigger and more capable suite of applications), and runs lickety-split on 80286s and XTs.

PC WORLD

The Small Office

REPORT



SPRING/SUMMER 1991

Fonts, formatting, virtually everything is automatic with Ensemble. There's really nothing easier.

Imagine what that special client will say when your next report looks like this. Imagine how fast people will pay your bills when they look professionally published.

For the small office, there's nothing better than GeoWorks Ensemble because it comes complete with everything you need to look your professional best.

With GeoWorks Ensemble, reports look published, memos seem majestic, and even simple letters look like you've spent hours formatting them.

A professional image for the small office.

ce, Starting With The Way You Print.

next creation while the first smoothly prints in the background. Or you might check out one of the many other applications included in Ensemble, like GeoManager™ a graphical file manager, GeoDex™ an electronic address book, Geo-

Planner™ a calendar/scheduler, America Online® an easy to use electronic mail and telecommunications service connecting you to thousands of PC users



and a wide variety of information services; or the calculator, notepad, banner maker, and solitaire game, all included in the Ensemble package.

Hard to believe, right? State-of-the-art performance on your

existing PC? Maybe that's why Ensemble has won so many awards in its first few months. But don't take our word for it, check out what the industry experts

are saying (we printed a few quotes above). Or take us up on our Working Model offer, so you can be the judge.

GeoWorks Ensemble, because performance is defined as much by the software in the PC as the hardware it runs on.

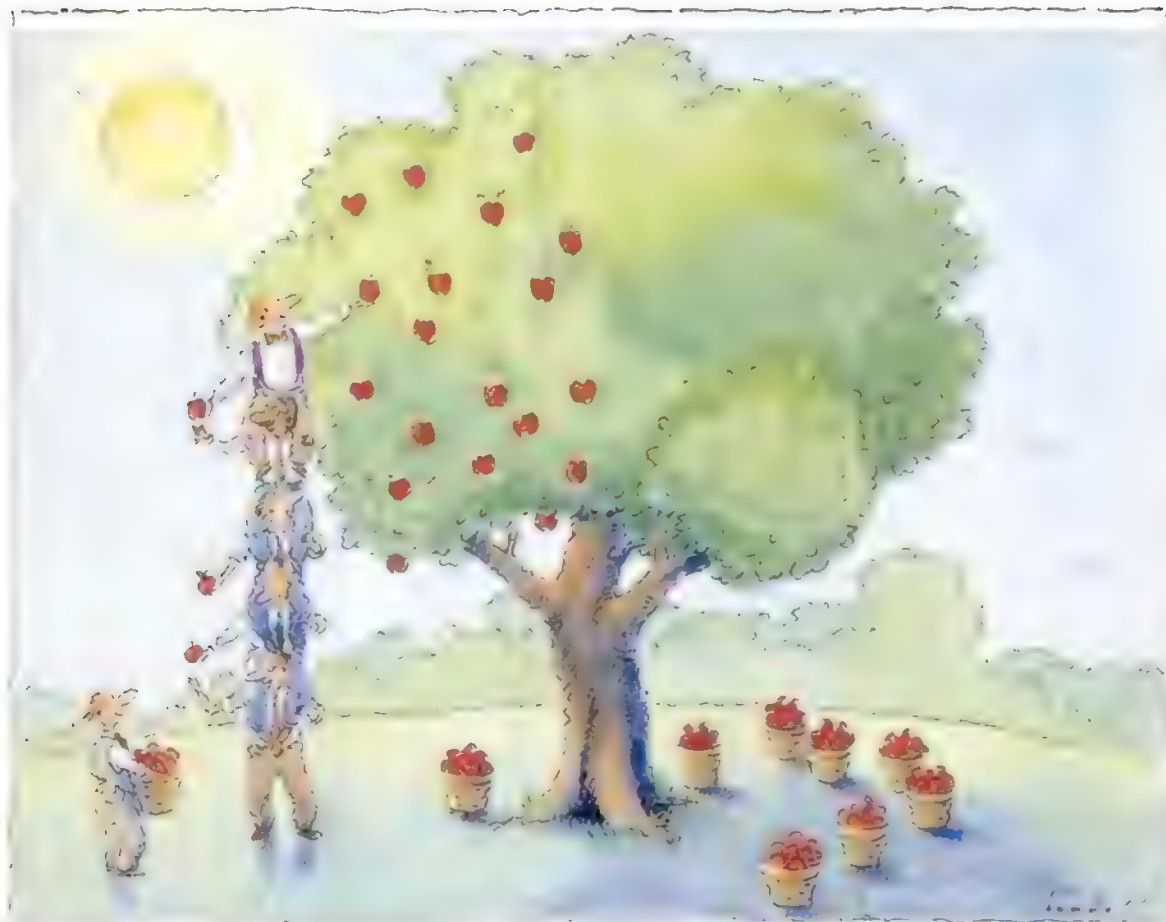


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CIRCLE 252 ON READER SERVICE CARD



Put Primavera multiuser to work. And see an instant improvement in team performance.

Large projects demand more than an assembled project team. *Teamwork* is what makes things happen.

That's the essential idea behind the multiuser capabilities of Primavera Project Planner®. Unlike many "multiuser" project management packages, Primavera offers *simultaneous* access to project files—and allows *simultaneous* generation of reports and graphics. The project team gets more done because team members aren't waiting in line for computer time.

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What's more, every Primavera Project Planner package lets you choose single user or multiuser functionality for your Novell, 3Com or Banyan network. You can grow into a multiuser environment without any cost penalty.

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CIRCLE 148 ON READER SERVICE CARD

by
Cristina Córdova
and Nate Zelnick

New & Improved

News of Announced Products and Upgrades

@Mail Delivers E-Mail Directly to Spreadsheet

NEW Lotus 1-2-3 and Symphony users can perform e-mail functions within a spreadsheet with Beyond's new add-in, *@Mail*. Functioning as a mail front end for networks, *@Mail* lets you launch an attached spreadsheet file (making it the current worksheet), send and share spreadsheets with formulas and macros in place, and attach your current worksheet without the hassle of paths, directories, and filenames. A \$129.95 starter kit allows bidirectional interoperability with native MHS products. Single nodes sell for \$79.95, and you can purchase an eight-node pack for \$395.

Beyond is packaging the product with a Quick-Send macro that lets you automate send backs. Utilizing the Lotus macro programming language, *@Mail* can automatically generate e-mail messages when a predetermined value occurs anywhere in the spreadsheet; it will automatically send a message upon set conditions within the spreadsheet. You can also use Lotus macros to create hotkeys for accessing *@Mail* and performing basic functions. And a template-creating macro



The *@Mail* in-box comes with a 1-2-3-like interface for working with e-mail.

lets *@Mail* consolidate spreadsheets by adding attached files to previous spreadsheets. To send spreadsheets to non-1-2-3 users, you highlight the range and paste it directly into the text of your message.

List Price: *@Mail* starter kit, \$129.95; single-node edition, \$79.95; eight-node expansion pack, \$395. **Requires:** 640K RAM, MHS, Lotus 1-2-3 2.01 or later or Symphony 1.1 or later, and DOS 3.1 or later. Beyond Inc., 38 Sidney St., Cambridge, MA 02139; 617-621-0095.

CIRCLE 431 ON READER SERVICE CARD

HOT PROSPECT

NORTON BACKUP FOR WINDOWS LETS YOU SCHEDULE BACKUPS FOR DOWNTIME

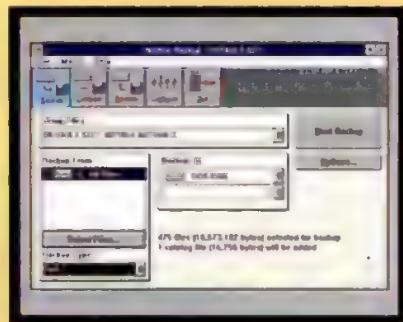
Symantec Corp. has developed a Windows version of its backup software. With high-speed DMA, *The Norton Backup for Windows* backs up files in the background while running other applications. The \$149 program runs customized or preconfigured backups in two keystrokes and contains a generic scheduler that enables unattended scheduled backups to floppy disks, network servers, or any other DOS device.

For added reliability, *The Norton Backup for Windows* offers advanced error correction code (ECC) and will reject bad floppy disks or corrupted files. An advanced mode offers more options in such areas as data verification and compression.

The Norton Backup for Windows automatically installs and configures itself on your PC and detects changes to the PC. Symantec is packaging the software with preconfigured backup setup files for Lotus 1-2-3, dBASE, Microsoft Word and Excel.

List Price: *The Norton Backup for Windows*, \$149. **Requires:** Windows 3.0. Symantec Corp., Cupertino, CA 95014-2132; 800-441-7234, 408-252-3570.

CIRCLE 430 ON READER SERVICE CARD



A generic scheduler lets you automate unattended backups.

Communications Server Sends Network Packets Over Dial-Up Lines

NEW Shiva's NetModem/E, a \$2,229 network communications server, enables remote dial-in, network dial-out, and connections between geographically separate networks.

Instead of transmitting screens, the NetModem/E sends standard network packets between the network and remote sites. This lets you run graphical applications, such as *Windows*—while retaining access to network services and data—regardless of the type of video screen or input device. You can also run network-based applications without leaving your customary interface.

The NetModem/E provides a customizable multilevel dial-in security with a call-back feature and complete user and administrator software for character-based DOS PCs, PCs running *Windows*, and Macintosh systems. It supports both *NetWare*'s IPX and Apple's *AppleTalk* protocols and automatically adapts to the protocol in use.

The standalone device consists of a Motorola 68000 processor (10 MHz), an Ethernet connection module (allowing for changes in cabling type), a Hayes-compatible 9,600-bps V.32bis/V.42bis modem, resident IPX and *AppleTalk* protocol stacks, and communications control software. In addition, the NetModem/E includes 512K of battery backed-up static RAM (expandable to 1MB) and 64K of ROM. **List Price:** NetModem/E, \$2,299. Shiva Corp., One Cambridge Center, Cambridge, MA 02142; 617-252-6300.

CIRCLE 432 ON READER SERVICE CARD

ARCnet Controllers Network Media Devices

NEW To enable networked sharing of video or media devices, Advanced Remote Technologies has designed the pro:mc (\$995) and the pro:mc-v (\$1,495). The two controllers allow multimedia programs to simultaneously and synchronously control up to 200 devices.

Fully compatible with ARCnet networks and protocol, the controllers accommodate both parallel and serial media device types. Both units come with a 32-character LCD, user-mode switches for address and driver selection, and battery-backed RAM driver memory.

CONTINUES ON PAGE 58

BRIEFS



INSTALLATION SOFTWARE

Island Systems is shipping *The Stork* installation

software. The \$175 package includes tools for configuring disk organization, creating user interfaces, specifying systems checks, and building media sets. Using CASE tools to create installation procedures, *The Stork* requires no programming or script files. 617-273-0421.

The Software Factory's EZ-Install toolkit helps developers generate installation routines and build final distribution disks. A language feature contains over 60 functions for extensive file manipulation. *EZ-Install* is available in a DOS version for \$149, an OS/2 version for \$249, and a combination DOS-OS/2 version for \$349. 214-490-0834.



TAPE BACKUP SYSTEMS

Colorado Memory Systems has introduced a 700MB

cartridge tape backup system. The \$1,119 QFA-700 comes complete with DOS application software. With an optional \$399.95 TC-02 tape controller, the company claims backup speeds of 10MB per minute. 303-669-8000.

Tandberg Data's Panther tape backup systems are available as both external and internal systems with capacities ranging from 60MB to 525MB (\$995 to \$2,695). According to Tandberg, backup/restore rates extend from 5MB per minute to 12MB per minute. 805-495-8384.



X-BASE DEVELOPMENT TOOLS

genSoft's dbFAST for

Windows is a standalone dBASE/X-BASE development language for *Microsoft Windows 3.0*. Developers who use dBASE, Clipper, and FoxPro can design graphical applications using all of their existing code. *dbFAST* for *Windows* includes an editor, a compiler, a linker, a runtime version, and support for DDE and DLL protocols. 206-562-1157.

Plaid Software Group has released *xbDraw*, a screen layout tool for X-BASE developers. The \$39.95 program reads SAY/GET code to define screen objects,

Unlike the pro:mc, the pro:mc-v includes a vertical interval timecode (VITC) reader and writer, as well as MIDI in and out, a character generator for creating "window dubs" of timecode values, and a generator for creating timing marks such as streamers and punches. **List Price:** pro:mc, \$995; pro:mc-v, \$1,495. Advanced Remote Technologies Inc., 307 Orchard City Dr., #204, Campbell, CA 95008; 408-374-9044.

CIRCLE 433 ON READER SERVICE CARD

Two Utilities Magnify VGA Laptop Images

NEW To reduce eyestrain and enhance laptop screens, two companies—**General Business Machines (GBM)** and **Microsystems Software**—have introduced screen magnification. Both utilities are memory resident and take up less than 10K of system memory.

LapZOOM, GBM's \$29 program, is designed for VGA laptops, notebooks, and multi-



LapZOOM allows you to magnify your screen up to four times its normal size.

scanning type monitors. Its Zoom view feature magnifies the screen by two or four times its normal size. Users can instantly zoom or unzoom from any word processing, spreadsheet, or desktop publishing application. *LapZOOM* also lets you change the size of your cursor by up to one full character.

Microsystems' MAGIC is designed for VGA, XGA, and Super VGA systems. It magnifies the screen two times its normal size in text, graphics, and *Windows* applications. The \$79 package includes an Advanced Programmer's Interface that provides tools to help developers incorporate *MAGIC* into their applications. **List Price:** *LapZOOM*, \$29. **Requires:** 5K of system memory and a VGA display. General Business Machines Corp., 6053 Bristol Pkwy., Culver City, CA 90230; 800-228-3349, 213-649-9199.

CIRCLE 434 ON READER SERVICE CARD

List Price: *MAGIC*, \$79. **Requires:** 8K of system memory and a VGA, XGA, or Super VGA display. *Microsystems Software Inc.*, 600 Worcester Rd., Framingham, MA 01701; 508-626-8511.

CIRCLE 436 ON READER SERVICE

\$29 On-Line Help for Harvard Graphics, DOS, Lotus, or WordPerfect

NEW Offering help for *WordPerfect 5.1*, *Lotus 1-2-3 2.2*, *DOS 3.3*, and *Harvard Graphics 2.3*, *Sybox's On-Line Advisor* (\$29.95) provides references with key sequences, examples, usage, and syntax.

You call up the *On-Line Advisor* using a predefined hotkey. Since it is a TSR program, you don't have to leave your work; the *Advisor* window opens up on top of your working document. When you type the item of inquiry, *Flash Lookup* jumps to it instantly. The *Smart Index* lists each topic in about ten different ways so you're sure to find it. To let you refer back to your working program, a view toggle key keeps your place within the *Advisor* text. A pull-down menu keeps track of the topics that you have previously looked up, so that you can return to them quickly.

List Price: *On-Line Advisor*, \$29.95.

Requires: 102K RAM, and 404K of hard disk space for *WordPerfect Advisor*; 462K for *Lotus 1-2-3 Advisor*; 274K for *DOS Advisor*; and 640K for *Harvard Graphics Advisor*. *Sybox Inc.*, 2021 Challenger Dr., Alameda, CA 94501; 800-227-2346.

CIRCLE 438 ON READER SERVICE CARD

Miniature PC: Halfway Between a Portable And a Desktop Computer

NEW *Flytech* is shipping its Carry-1 9000 series, which has a design similar to the Ergo Brick.

The CPU in each model comes in a compact case about the size of a typical notebook: 1.8 by 9.4 by 7.3 inches. It has a small detachable keyboard and a socket for an external monitor. *Flytech* also offers optional 9- and 10-inch monitors.

The systems come with up to 4MB of RAM on the motherboard, a high-density floppy disk drive, a hard disk up to 80MB, and a single 8-bit half-length expansion slot. It provides coprocessor sockets as well as two serial and one parallel port.

The systems, costing from \$400 to \$3,000, come with a 12- or 16-MHz 286 or a 16-MHz 386SX CPU. The 12-MHz system comes with a monochrome/CGA interface, while the 16-MHz systems have a Super VGA display interface with 1,024-by-768 resolution and 512K of video memory on board. Each system is delivered with the 81-key Carry-1 mini keyboard, which has 101-key functionality. *Flytech* packages the Carry-1 with a carrying case, a mini-tower stand, and DR DOS 5.0. **List Price:** Carry-1 9000 series, \$400 to \$3,000. *Flytech Technology*, 3008 Scott Blvd., Santa Clara, CA 95054; 408-727-7373.

CIRCLE 437 ON READER SERVICE CARD



Borland's Paradox. Grasp the power of the new standard

Paradox® is now the recognized standard against which all other databases are measured. A database that is as

powerful as it is easy to use. That's why Paradox has won virtually every database award since its introduction. Including Best Programmable Database for both single-user and multiuser environments (*InfoWorld*, November 1990), the #1 SQL Front End (*NSTL*, February 1991) and Editors' Choice (*PC Magazine*, May 1991). Now you can grasp all of the power that Paradox offers.

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Paradox's legendary combination of power and ease-of-use has made it the standard for applications developers and users alike. Paradox comes with a full-blown development language, PAL™, for building custom database applications. Plus features such as Query By Example,

multi-table forms and reports, and presentation-quality graphics that make Paradox the #1 choice of database users.

Extend Your Reach!

Paradox Engine and Paradox SQL Link

Paradox® Engine provides C, C++ and Pascal programmers with an Application Programming Interface (API), so your programs can access Paradox data in both single-user and multiuser environments. And with Paradox® SQL Link users can access remote data stored in SQL servers.*

dBASE† Owners!

Grasp Paradox RISK FREE for only \$175

If you own any version of dBASE®, you can upgrade to Paradox 3.5 for only \$175. That's a substantial savings off of the \$795 list price. And you get a 60-day, money-back guarantee. Risk Free. Paradox even reads and writes dBASE files for integration into your existing environment. Order today. See your dealer or call now at 1-800-331-0877.

B O R L A N D

Software Craftsmanship

CIRCLE 285 ON READER SERVICE CARD

CODE: ME83

*Microsoft, SYBASE, IBM, Oracle and DEC Rdb/VMS servers supported now. Paradox SQL Link (\$495 list price, sold separately) and Paradox 3.5 are required to make the connection with SQL servers. Paradox Engine is sold separately. †Offer also valid for owners of R:BASE, dBaseIII and FoxPro. Upgrade offer expires 10/31/91. Pricing is in U.S. dollars. Offer good in U.S. and Canada only. Copyright © 1991 Borland. B1 1412

BRIEFS

and replaces the modified code back into the procedure upon completion. It supports all dBASE IV GET options, and includes a color picker and a preview mode. 800-776-0739, 501-375-6622.



PRINTER FONT OPTIONS

Computer Peripherals has designed an HP format font

cartridge for use with small laser printers that emulate the LaserJet II and have a standard HP font cartridge slot.

ActionSet! offers 102 hand-tuned fonts and is equipped with both math and tax form font capabilities. The \$199 cartridge comes with drivers for many popular applications. 800-854-7600, 805-499-5751.

Metro Software's LaserTwin In A Cartridge brings LaserJet IIP compatibility to Canon laser printers. The \$349 emulation cartridge provides complete HP LaserJet Series II emulations for the Canon LBP-8 Mark series and LBP-4 laser printers in any environment. 800-621-1137, 602-292-0313.

EAC (Engineering Automation and Control) has introduced *Zbar*, a \$35 program for printing bar codes. Running under both DOS and OS/2, *Zbar* provides 14 different bar code symbolologies, and lets you print up to 99 labels while still entering data. 315-463-1228



LAN ADAPTERS

D-Link Systems is shipping a \$495 10Base-T Ethernet/

Hub adapter. The 16-bit server adapter connects up to five nodes; you can cascade the adapters for a total of eight connections. 714-455-1688.

Invisible Software has expanded its line of Ethernet products with 8-bit (\$369), 16-bit (\$369), and Micro Channel (\$429) 10Base-T adapters and an 8-port 10Base-T hub (\$949). The products use unshielded twisted-pair cables. 415-570-5967.

Solctek has introduced a new series of external LAN adapters that link a PC or laptop to three widely used LAN cabling systems: Thin Ethernet (\$499.95), 10Base-T (\$499.95), and ARCnet (\$399.95). 619-450-1220.

Acer and Everex Ship 486SX-Based Systems

NEW Since the recent release of the Intel 20-MHz 486SX microprocessor, we've seen several companies break through the crowds with 486SX systems. Joining the quest for low-cost access to the power of 486 computing, **Acer America** and **Everex Systems** have both introduced families of 486SX PCs.

All of Acer's 486SX systems are modular and processor-upgradable to the more powerful versions of Intel's 486 architecture. The \$2,745 **AcerPower 486SX**, an ISA-based workstation, comes standard with 2MB RAM and four 3.5-inch or one 5.25-inch and two 3.5-inch storage bays. Three SIMM sockets enable expansion up to 96MB RAM (with 16MB RAM chips). The system's Ultra VGA chip set supports 1,024-by-768 noninterlaced resolution.

Acer also offers two EISA-based systems, the **AcerPower 500** (\$3,745) and the **AcerFrame 1000** (\$4,995). With up to 256MB RAM, the **AcerPower 500** holds three 5.25-inch and one 3.5-inch storage bays in its footprint configuration. The **AcerFrame 1000** tower system comes with 4MB RAM (expandable to 128MB with 16MB RAM chips) and eight EISA expansion slots with room for one 3.5-inch and six 5.25-inch or nine 3.5-inch and two 5.25-inch storage bays.

Everex System's **Step 486SX/20**, with up to 64MB RAM, utilizes Everex's proprietary Advanced Memory Management Architecture (AMMA) cache, which is scalable to 256K and achieves a claimed speed of 13 mips. Everex Systems offers the **Step 486SX/20** in a \$3,999 small desktop chassis, a \$4,099 large desktop chassis, and a \$4,599 tower chassis. For \$2,999, the **Tempo 486SX/20** holds 1MB RAM (expandable to 32MB), a 128K write-back cache, and a VESA-compatible Super VGA adapter in a small footprint chassis.

All the Everex 486SX PCs include an integrated IDE hard disk drive interface, floppy disk controller, two serial ports, and a parallel port. Everex also bundles them with DOS 4.01, *Windows* 3.0, and a 400-dpi Everex mouse. For the additional computational abilities of a floating-point unit, you can also add an Intel math coprocessor.

List Price: **AcerPower 486SX**, \$2,745; **AcerPower 500**, \$3,745; **AcerPower 1000**, \$4,995. **Acer America Corp.**, 401 Charcot Ave., San Jose, CA 95131; 408-922-0333.

CIRCLE 438 ON READER SERVICE CARD

List Price: The **Step 486SX/20**, \$3,999 in a small desktop chassis, \$4,099 in a large desktop chassis, and \$4,599 in a tower chassis; The **Tempo 486SX/20**, \$2,999. **Everex Systems Inc.**, 48431 Milmont Dr., Fremont, CA 94538; 800-992-3939, 415-498-1111.

CIRCLE 439 ON READER SERVICE CARD

124-Key, Programmable Keyboard Embellishes Gateway 2000 Systems

NEW Measuring 4.25 by 16.5 by 16 inches (HWD), **Gateway 2000's** mini-desktop computers feature a new, curvilinear design. Gateway 2000 promises to ship the systems with an AnyKey keyboard on which any of 124 keys can be programmed to perform any function.

The mini-desktop PCs come in several models—a 286/16 (\$1,395), a 386SX/16 (\$1,595), and a 386SX/20 (\$1,995). The two 16-MHz machines come standard with 2MB RAM and a 40MB IDE hard disk, while the 386SX/20 comes with 4MB RAM, an 80MB hard disk, and a 32K SRAM cache. For all machines, the RAM is expandable to 16MB, and the hard disks are expandable to 200MB. In addition, each system has both 3.5- and 5.25-inch floppy disks, a VGA display chip set, a 1,024-by-768 by 16-color interlaced monitor, two serial ports, one parallel port, a mouse port, and a riser card with five 16-bit slots. Gateway packages all its mini-desktops with DOS 3.3 or 4.01. The two 386SX machines also come with *Windows* 3.0 and a mouse.

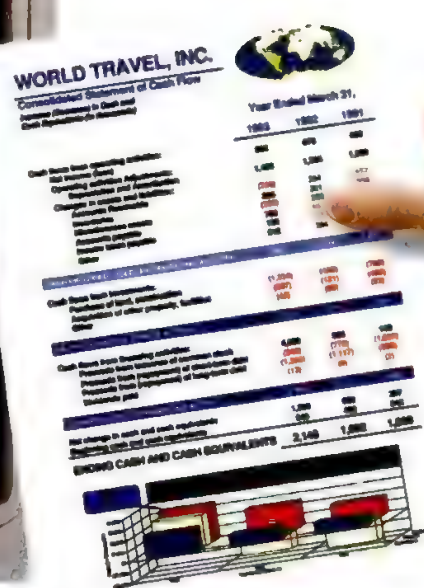
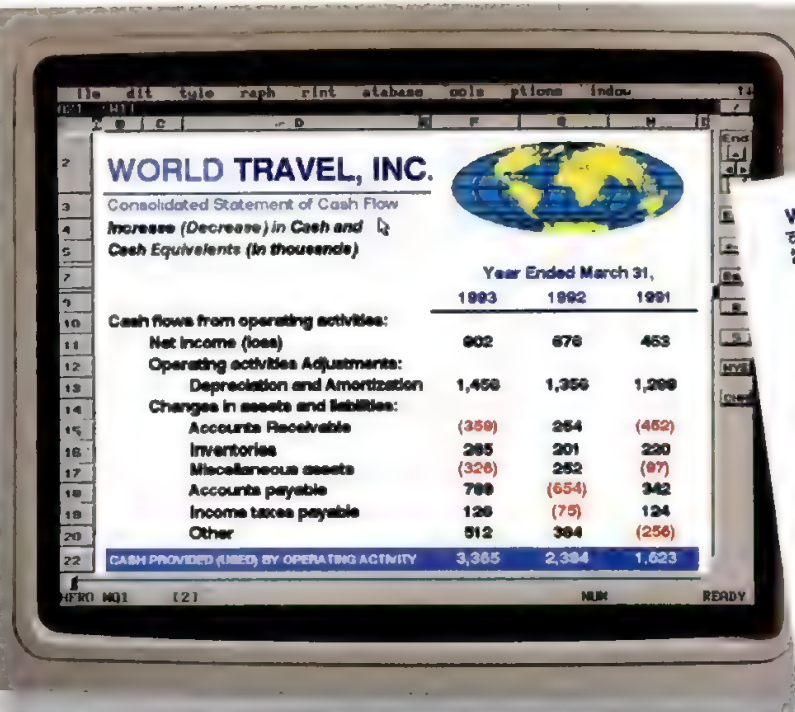


Gateway 2000 is shipping its mini-desktop PCs with a 124-key programmable keyboard.

The AnyKey keyboard allows you to program any key to perform the function of a different key or sequence of keystrokes. You can also remap the entire layout by loading the new configuration onto the hard disk files. In addition, the keyboard offers diagonal cursor keys, an unshifted asterisk, two Backslash keys, and two complete sets of function keys located along the top and left sides of the board.

List Price: 286/16, \$1,395; 386SX/16, \$1,595; 386SX/20, \$1,995. **Gateway 2000**, 610 Gateway Dr., N. Sioux City, SD 57049; 800-523-2000, 605-232-2000.

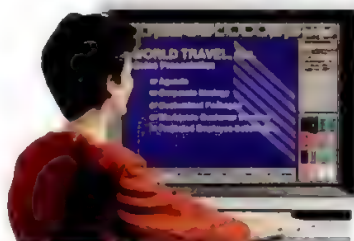
CIRCLE 440 ON READER SERVICE CARD



With Quattro Pro's WYSIWYG, what you see onscreen is what you get on paper.

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Feature	Quattro Pro	1-2-3 r3.1	1-2-3 r2.2
"Live" editable WYSIWYG spreadsheet	Yes	Yes	No
WYSIWYG page preview	Yes	No	No
Banner (sideways-oriented) printing	Yes	No	No
Print-To-Fit* automatically on a page	Yes	Yes	No
Backsolver technology built in	Yes	No	No
3-D graphs (ribbon, step, bar, area, pie)	Yes	No	No
Worksheet zoom	Yes	Yes	No
Draw package built in	Yes	Yes	No
Clip art library	Yes	No	No

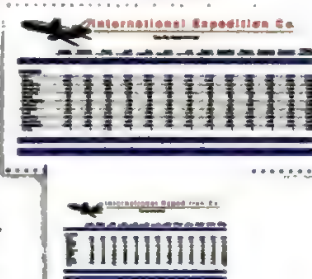
a theatre full of graphics, publishing and presentation features that will dazzle even the most demanding audience. And, unlike 1-2-3 r3.1, all of Quattro Pro's features, including WYSIWYG, are seamlessly integrated into one set of menus, greatly enhancing ease-of-use. Just another example of how Quattro Pro's advanced technology is built in... not tacked on.

1-2-3 Users!

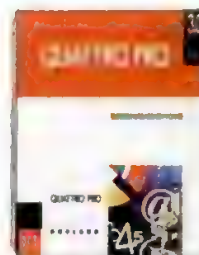
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B O R L A N D

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CIRCLE 287 ON READER SERVICE CARD

Improved

BRIEFS



MATHEMATICAL

MathSoft now offers its technical calculation package, *MathCAD* (\$495) for Windows. The package offers a "scratchpad" metaphor that allows users to jot down information, graphics, and standard math notation anywhere on a page. *MathCAD 3.0* has an on-line library of formulas, constants, and diagrams. 617-577-1017.

Jandel Scientific has added extended and expanded memory support, more fonts, and drop-down menus to *Sigma-Plot* (\$495), its scientific graphing package. 415-924-8640.

CET Research Group, makers of the *Simultaneous Equation Solver, SEQS* (\$150), has added unique constraint and scaling options, extended error trapping, coprocessor support, and graphics support to the package. 405-360-5464.



BACKUP SOFTWARE

Mountain Network Solutions now has data compression built into its tape backup software. The compression algorithm doubles the capacity of Mountain's *FileSafe 4000* and *FileSafe 8000Plus* tape drives, according to the company. 408-379-4300.

SitBack Technologies has ported its automatic backup software, *SitBack*, to Windows (\$139.95; upgrades \$39.95). The product takes advantage of Windows' multitasking to allow transparent back up constantly or at preselected intervals. 800-873-7482, 913-894-0808.



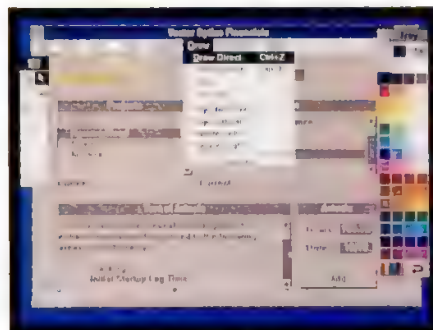
CONNECTIVITY

Tall Tree Systems has added 150- to 300-dot-per-inch printing, a programmable phone book, Canon LaserJet and HP DeskJet support, and multiple line/LAN printing to Fax-O-Matic (\$399), its plain-paper fax laser printer add-on. 415-493-1980.

Mozart Systems now offers *Mozart 3.0* development environment (\$7,000; each runtime version \$500 each) the Windows 3.0 version of its PC-to-mainframe application development tool. The upgrade allows large, multiprocessor applications to be built under both DOS and Windows. 408-970-0277.

Big Speed Gain Claimed for ToolBook

IMPROVED Asymetrix—the company started by Microsoft cofounder Paul Allen to develop Windows tools—has overhauled *ToolBook for Windows* to significantly advance the application development system's speed in search functions. The company claims that with Version 1.5, searching will be 28 times faster and speed gains will be seen in scrolling, screen drawing, and page flipping.



Version 1.5 of Asymetrix's *ToolBook* should run existing applications faster.

Also new to this version is direct import support for .DIB, TIFF, EPS, and .DRW graphics formats; DLL and DDE enhancements; a more-comprehensive set of Windows' tools; and network file locking. Version 1.5 will run existing *ToolBook* files, allowing current users to benefit from the improvements.

List Price: *ToolBook*, Version 1.5, \$395; upgrades, \$75. **Requires:** 2MB RAM, DOS 3.1, Windows 3.0. Asymetrix Corp., 110 110th Ave. NE, Ste. 717, Bellevue, WA, 98006; 800-626-3225, 206-637-1500.

CIRCLE 441 ON READER SERVICE CARD

32-Bit Programming for Everybody Else

IMPROVED 32 Bit Software has enhanced ZBasic-PC, optimizing its compiler to create 16- and 32-bit applications. Programs designed for 386 and 486 systems can be built on any system, including Macintosh and CP/M machines running other versions of ZBasic, and then recompiled on a 386 or 486 PC to take advantage of 32-bit systems.

Version 4.6 also offers support for all graphics formats. Communications are faster with a 64K interrupt-driven buffer that offers 115,200 bits per second on four ports simultaneously. The product also has full network support. **List Price:** ZBasic-PC, Version 4.6, \$149.95; upgrades, \$59.95. **Requires:** 128K, DOS 2.0 or later. 32 Bit Software Inc., 3232 McKinney, Ste. 865, Dallas, TX 75204; 800-322-4879, 214-720-2051.

CIRCLE 442 ON READER SERVICE CARD

Drive Test Finds and Corrects Floppy Problems

IMPROVED Over time, your floppy disk drive will get out of alignment. To make sure that your drive doesn't die unexpectedly, taking disks along with it, **Touchstone Software** has released the *Check It Floppy Drive Testing System 1.2*. The package consists of a series of diagnostics that test the drive's alignment, clamping, hysteresis (accuracy in seeking from one track to another and back), speed, and its ability to read a disk's track 0.

The system tests both 3.5- and 5.25-inch formats by comparing the drive with properly aligned disks, which use spiral rather than concentric tracks. Also included is *Line Up*, which can fix some alignment problems.

List Price: *Check It Floppy Drive Testing System*, Version 1.2, \$99.95 dual format pack, \$59.95 for single format. **Requires:** 256K, DOS 2.0 or later. Touchstone Software Corp., 2130 Main St., Ste. 250, Huntingdon Beach, CA 92648; 714-969-7746.

CIRCLE 443 ON READER SERVICE CARD

Low-End Flat-File Database Goes GUI

IMPROVED ButtonWare has radically altered its dBASE-compatible flat-file database, *PC-File*. Version 6.0 adds a text-based CUA-compliant (common user access) menu structure that uses buttons, scroll bars, pull-down menus, and dialog boxes.

Program improvements include: the addition of keyboard macros and streamlined program macros; mouse-driven indexing; one-step database definition; and a "read-only" mode that blocks changes to a database.

List Price: *PC-File*, Version 6.0, \$100; upgrades, \$49.95. **Requires:** 450K, DOS 3.0 or later. ButtonWare Inc., P.O. Box 96058, Bellevue, WA 98009-4496. 206-454-0479.

CIRCLE 444 ON READER SERVICE CARD

\$49 Upgrade of MNP/5 To V.42bis

IMPROVED In addition to offering a new line of low-cost 2,400-bps V.42bis MNP/5 modems, **Practical Peripherals** now offers a software upgrade for current owners of the PM2400 series to the V.42bis data compression standard. The standard allows virtual throughput of 9600 bps when connected to another V.42bis modem.

List Price: PM2400 V.42bis upgrade, \$49. **Requires:** PM2400 series modem. Practical Peripherals, 31245 La Baya Dr., Westlake Village, CA 91362. 800-442-4774; 818-706-0333.

CIRCLE 710 ON READER SERVICE CARD

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Service and Reliability Survey
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"It is well constructed, very expandable, and one of the best 386SX performers we've seen...we rate the Swan's performance excellent."



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- Quadtel 386SX BIOS
- 1MB of 16-bit, 80ns RAM, Expandable to 8MB on Systemboard
- Your Choice: 1.2MB 5.25" or 1.44MB 3.5" Floppy Drive
- 200 Watt Power Supply
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- Small Footprint Baby AT Case
- Ports: 2 Serial, 1 Parallel
- 7 Expansion Slots: 6) 16-bit, 1) 8-bit
- Enhanced 101-key Keyboard
- Swan Setup & Utilities Diskette
- FCC Class B Rated
- Complete Highly-rated Documentation
- MS-DOS®, OS/2®, UNIX® and Novell® Compatible

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Complete 50MB Mono System

Call for prices on our 20MHz 386SX systems

386SX/16	Video Options Include Monitor & Video Adapter			
	Drive Options	Mono	14" Flat Mono	1024 VGA
w/50MB (17ms) IDE		\$1295	\$1345	\$1495
w/100MB (17ms) IDE		\$1545	\$1595	\$1745
w/200MB (16ms) IDE		\$2045	\$2095	\$2245

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16MHz 2MB Performance System

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Swan 386/25

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- Intel 80386-25™ System
- AMI 386 BIOS
- 1MB of 32-bit, 80ns RAM, Expandable to 16MB
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- 3 Exposed Half-height, 1 Internal 3.5" Device Bays
- Small Footprint Baby AT Case
- Ports: 2 Serial, 1 Parallel
- 8 Expansion Slots: 1) 32-bit, 5) 16-bit, 2) 8-bit
- Enhanced 101-key Keyboard
- Swan Setup & Utilities Diskette
- FCC Class B Rated
- Complete Highly-rated Documentation
- MS-DOS®, OS/2®, UNIX® Compatible

\$1695
Complete 50MB
Monochrome System

386/25	Video Options Include Monitor & Video Adapter			
	Drive Options	Mono	14" Flat Mono	VGA Mono 1024 VGA
w/50MB (17ms)IDE		\$1695	\$1745	\$1895
w/100MB (17ms)IDE		\$1945	\$1995	\$2145
w/200MB (16ms)IDE		\$2445	\$2495	\$2645
			\$2845	\$2845

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- 4MB of 32-Bit RAM Expandable to 16MB
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- 200 Watt Power Supply
- Intel 80386DX-33" & Weitek 3176 Coprocessor Socket
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- Ports: 2 Serial, 1 Parallel
- 8 Expansion Slots: 1) 32/16-bit, 7) 16-bit
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Drive Options	Mono	14" Flat Mono	VGA Mono	1024 VGA
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w/200MB (16ms)IDE	\$2895	\$2945	\$3095	\$3195
w/400MB (15ms)SCSI	\$3795	\$3845	\$3995	\$4195
w/660MB (16.5ms) SCSI or ESDI	\$4395	\$4445	\$4595	\$4795

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Tower Case Option for 386/25C, 386/33 and 486 Systems
Includes 300W Power Supply, Dual Cooling Fans and 7 Device Bays
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Swan 486/33

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- 1.2MB 5.25" & 1.44MB 3.5" Floppy Drives
- 200 Watt Power Supply
- Weitek 4167 Coprocessor Socket
- 5 Exposed 5.25" and 2 Internal 3.5" Device Bays
- Ports: 2 Serial, 1 Parallel
- 8) 16-bit Expansion Slots
- Enhanced 101-key Keyboard
- Swan Setup & Utilities Diskette
- Complete Highly-rated Documentation
- OS/2® and UNIX® Compatible
- Includes MS-DOS v4.01

\$3995

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—PC Magazine, 9/11/90

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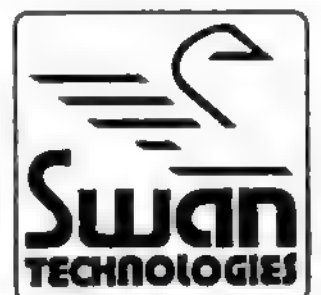
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Reviews of the Latest Books for the PC User

Quintessential AutoCAD Guide Revised for Release 11

In the beginning, there was *AutoCAD*. Shortly thereafter came *Inside AutoCAD*. Now in its sixth edition and completely revised to include both Release 10 and Release 11, *Inside AutoCAD* remains the quintessential *AutoCAD* tutorial.



Lessons covering *AutoCAD*'s entity types and editing commands utilize a PC expansion board drawing; readers create a three-dimensional engine cylinder, a housing subdivision, and a piping flange in later exercises.

Throughout the book, the authors provide tips for speeding up your work and keeping file size manageable.

The final part of the book

concerns *AutoCAD* customization. In two chapters the authors explain how to customize the standard menu, write macros, and create new commands using the AutoLISP programming language. The appendices conclude with an alphabetical command reference, an *AutoCAD* installation and troubleshooting guide, and an excellent reference to all of *AutoCAD*'s system variables.

As the *AutoCAD* program has grown, successive editions of this book have grown with it; so much so that some of the more detailed chapters have become entire books unto themselves. *Inside AutoCAD*

is at times guilty of making a sales pitch for these other books. Still, it provides the most complete tutorial to an exceedingly complex program. And when Autodesk releases its next upgrade, you can bet Raker and Rice will be there with yet another edition of their classic.

—David Cohn

Inside AutoCAD: The Complete AutoCAD Guide

by Dan Raker and Harbert Rice,
\$34.95, New Riders Publishing,
Carmel, IN 46032; 800-428-5331.
ISBN: 0-934035-55-5

CIRCLE 543 ON READER SERVICE CARD

Rusty Gesner's revision of Dan Raker and Harbert Rice's *CAD* classic retains the clear organization and breezy style prevalent in earlier editions. In over 900 pages the authors provide tutorials covering virtually every aspect of *AutoCAD* as well as a clear explanation of the steps necessary to prepare three-dimensional models for use with Autodesk's rendering software, *AutoShade*.

The book is divided into three distinct sections: 2-D, 3-D, and customizing *AutoCAD*. The 2-D portion comprises well over half the book, since most skills learned for creating two-dimensional drawings are directly applicable in the third dimension. The book begins with a step-by-step explanation of starting *AutoCAD*, entering the drawing editor, and drawing a first line. From there, *Inside AutoCAD* progresses into the tools that enable *AutoCAD* to create accurate drawings of limitless complexity.

Each lesson is accompanied by commented, step-by-step exercises showing all the necessary commands, prompts, and user input. Almost every page features a screen shot so you can not only follow the tutorial within the text but compare your results with those expected.

Once past the introductory material, the exercises are drawn from real-world applications.

AutoCAD Encyclopedia Excels as Tutorial



In the strictest sense, *Encyclopedia AutoCAD* is not truly an encyclopedia. But in its 1,200-plus pages, it does

cover almost every command, function, and feature of *AutoCAD*, Release 11, albeit in a nonalphabetical arrangement.

Robert Thomas' book begins with an overview of *AutoCAD* and its installation, the hardware required to run it, and methods through which its performance can be enhanced, including dealer support, international user groups, and dedicated magazines.

Rather than providing all the information in a single alphabetized book, *Encyclopedia AutoCAD* breaks *AutoCAD*'s complexity into smaller sections. Each of these sections presents information in a logical progression, making the book more useful as a learning tool at the expense of quickly locating information. A total of 11 chapters concern them-

selves with *AutoCAD*'s commands and variables. This could make locating a given entry a bit daunting, but an excellent index helps shorten the search.

Each entry provides a brief definition, any options, detailed examples of command usage, and a list of related commands and system variables. Each variable also includes its data type and default value. Thomas also deals with writing your own menus, macros, shapes, and text fonts, a feature omitted from several other *AutoCAD* books. A lengthy chapter covers all of AutoLISP's commands and functions while several others deal with manipulating *AutoCAD*'s internal database.

The title's claims to the book's arrangement can be forgiven, for *Encyclopedia AutoCAD* certainly delivers an encyclopedia's expectation, containing information on all branches of *AutoCAD* knowledge. —D.C.

Encyclopedia AutoCAD, Release 11

by Robert M. Thomas, \$39.95,
Sybex Inc., Alameda, CA 94501;
800-227-2346.
ISBN: 0-89588-734-7

CIRCLE 544 ON READER SERVICE CARD

AutoLISP Routines Add Value to 1,000 AutoCAD Tips



George and Jan Head's *1000 AutoCAD Tips and Tricks* is neither a reference nor a tutorial. The title is a bit misleading

as well, for inside this 560-page book (short by *AutoCAD* standards), you'll find much more than the promised 1,000 tips and tricks.

1000 AutoCAD Tips and Tricks is divided into three distinct sections: beginner, intermediate, and advanced. Each section is further divided into nine chapters, addressing major subjects of *AutoCAD* tips and techniques designed to increase your productivity. The chapters end with collections of AutoLISP routines, which often provide a single-step method of performing a tip described in the chapter.

It's these AutoLISP programs that are the real value in this book. And by registering your copy using the form enclosed,

CONTINUES ON PAGE 69



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CONTINUED FROM PAGE 67

you're entitled to two free upgrades containing additional tips available in the spring and fall of each year.

The Heads' book should provide more than enough true tips and tricks to increase any AutoCAD user's productivity. You'll still need a good AutoCAD reference, but *1000 AutoCAD Tips and Tricks* remains a worthy addition to your AutoCAD library. —David Cohn

1000 AutoCAD Tips and Tricks, Second Edition

by George O. Head and Jan Doster Head, \$24.95 (\$49.95 with disk of AutoLISP routines), Ventana Press Inc., Chapel Hill, NC 27515; 919-942-1140. ISBN 0-940087-53-7
CIRCLE 545 ON READER SERVICE CARD

First PageMaker 4 Offering Fails to Aid Power Users



The hands-on instructions that characterize *Using PageMaker 4 for the PC* by Martin S. Matthews and Carole

Boggs Matthews are perfect for new users to this classic DTP program. In fact, this step-by-step guide—that walks you through creating a flyer, a sales order form, a brochure, an annual report, a newsletter, and a catalog—is so clear that it is almost impossible to make a mistake.

Though each chapter builds upon the skills that have been established in previous sections, it

is this excruciating attention to detail that limits the usefulness of the book. Rote imitation is often favored over discussion of important design concepts.

However, the Matthews get big points for emphasizing PageMaker's role as an integration tool. Several tutorials demonstrate how the stylesheets and formatting attributes created in word processors, like WordPerfect, will import intact into a PageMaker document.

Unfortunately the authors of *Using PageMaker 4* seem to be unfamiliar with the program's new powerhouse features. The Story Editor, for example, isn't mentioned until page 413, and only superficially at that. Chapter 4 contains over 50 pages of instructions that include precise measurements, and complicated ruler guides to create a sales order form. The Matthews seem unaware that Aldus's Table Editor, with its automatic formatting and

alignment features, could cut the workload in half.

And no exercise anywhere in this book addresses PageMaker's long document functions, links to external files, cross-referenced indexes, or automatic table of contents generation.

Both the detailed preliminary discussion of the Windows environment, and the appendix that covers recent developments in font technology (including Adobe Type Manager) are a real boon. But the book's content and repetitious teaching method make it suitable only for beginners.

—Luisa Simone

Using PageMaker 4 for the PC, Third Edition

by Martin S. Matthews and Carole Boggs Matthews
\$26.95 (\$29.95 with disk of sample files), Osborne McGraw-Hill, Berkeley, CA 94710; 800-227-0900. ISBN: 0-07-881629-7
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CIRCLE 514 ON READER SERVICE CARD

edited by
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Toolkits

Reviews of the Latest Tools for the PC Programmer

Tier C++ Class Library: Objects Alone Don't Ease Windows Development

Tier C++ Class Library, from Sturmer Hauss, is intended to ease *Windows* 3.0 development by providing an object layer atop *Windows*' traditional C interface. It is compatible with Zortech's C++ 2.1 (large memory model), Glockenspiel 1.2E1 (medium memory model) and 2.0 (large memory model), as well as Borland's C++ 2.0 (large memory model). You can support protected mode using Tier C++ Class Library with any one of the products listed above. However, only Glockenspiel 1.2E1 will support real mode.

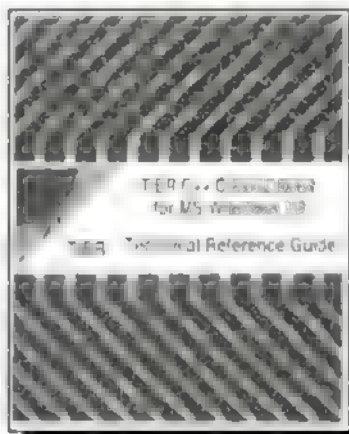
The software comes on either two 3.5- or 5.25-inch floppy disks and occupies about 2MB of hard disk space. The package also comes with an 8.5-by-11-inch loose-leaf binder of about 1,400 pages of documentation. However, instead of the conventional front-to-back page numbering, this manual is numbered according to class boundaries. Since the majority of the sections don't exceed 20 pages, there are a lot of pages numbered 1, 2, and 3 in the span of some 1,400 pages. I found this an awkward system to use, especially because it's such

a large manual and is 99 percent reference. The manual recommends that you acquire the usual *Windows* references to use in addition to Tier's.

STURMER HAUSS'S LAYERED APPROACH

The name *Tier* comes from Sturmer Hauss's vision of a three-layered approach to GUI software development. It envisions a low-level tier of classes to talk to the underlying system, an intermediate tier that is a more generic set of C++ classes, and a high-level tier that is truly platform independent. The present product is only the lowest tier. However, the company anticipates releasing the second tier by the fall, and the third tier by the end of the year.

Sturmer Hauss's press release claims that "Tier dramatically increases programmer productivity by providing a complete class library of abstractions." However, Tier's installation program displays a far more accurate description: "Over 100 classes mirroring the *Microsoft Windows* SDK



as faithfully as possible." And there's the rub, as I see it. Why would you want to create or buy something that mirrors an interface known far

and wide for its complexity and inscrutability? The role of a *Windows* class library is to deliver the power, not mirror the problems.

USING TIER

C++ Class Library provides a version of Charles Petzold's multiple document interface (MDI) demonstration program rewritten using the Tier library. Petzold's original C version is about 500 lines long; the Tier version is about 800 lines. Petzold's .EXE file is about 13K and loads instantly; Tier's .EXE is 42K and loads in about ten seconds on a modest 386 clone. Many programmers would willingly trade away some .EXE size and load speed for a more productive environment, but with Tier you're trading your seed corn.

What do you gain in return? Unfortunately, Tier isn't a simpler or more productive environment. The level of detail is about the same as that of *Windows*; the library just uses C++ class notation instead of C struct notation. Is Tier a safer, more reliable environment to work in? It has the potential to be, because C++ enforces much stricter compilation checks than C. But once again, C++ Class Library falls short because, as with the *Windows* SDK, different sorts of things share the same data type.

For example, in the *Windows* SDK there are C typedefs for 15 different types of handles;

handles for windows (HWND), palettes (HPALETTE), and everything in between. But even though there are 15 separate names, to a C compiler these are just 15 ways of saying "unsigned integer;" any place an HWND is needed, an HPALETTE is equally acceptable as far as the compiler is concerned. But if you make such a reversal in your program, serious errors will occur during execution.

To illustrate the lack of safety, I purposely made some typical *Windows* programming errors using one of Tier's example programs. In the original program, the creation of a child window was coded as shown in Section A of the figure below. I deliberately reversed two of the parameters to produce the code shown in Section B of the figure.

Now, had I been using a good class library, these mistakes would be flagged by the compiler. But because of Tier's unsafe design, each and every one escaped the notice of the compiler, leading to the ubiquitous UAE (unrecoverable application errors), freezes, and the like.

Object-oriented purists, who often have Smalltalk, Eiffel, and Simula in their blood, criticize C++ because it supplies object-oriented features on top of a C mentality. Tier may be one of their best examples. It's written in C++ and is based on objects, but doesn't manage to transcend the C paradigm.—Kaare Christian ■

Tier C++ Class Library

List Price: \$450. **Requires:** 2MB of disk space, 1MB of RAM (although 4MB is recommended), and a 286 PC. Sturmer Hauss Corp., 685 West Long St., Stephenville, TX 76401; 817-965-2227. Marketed by Genesis Development Corp., 1303 Columbia Dr., #209, Richardson, TX 75081; 800-736-8519.

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Section A:

```
lpHelloWin[i] = new MDIHelloWindow( this, lpMDIClient,
                                     1, "MDIHelloChild", hMenuInit, hMenuInitWindow );
```

Section B:

```
lpHelloWin[i] = new MDIHelloWindow( this, lpMDIClient,
                                     hMenuInit, "MDIHelloChild", 1, hMenuInitWindow );
```

To test the safety of Tier C++ Class Library, two of the parameters in Section A were purposely reversed, as shown in Section B. When the program containing the code in Section B was compiled, the mistakes went undetected.

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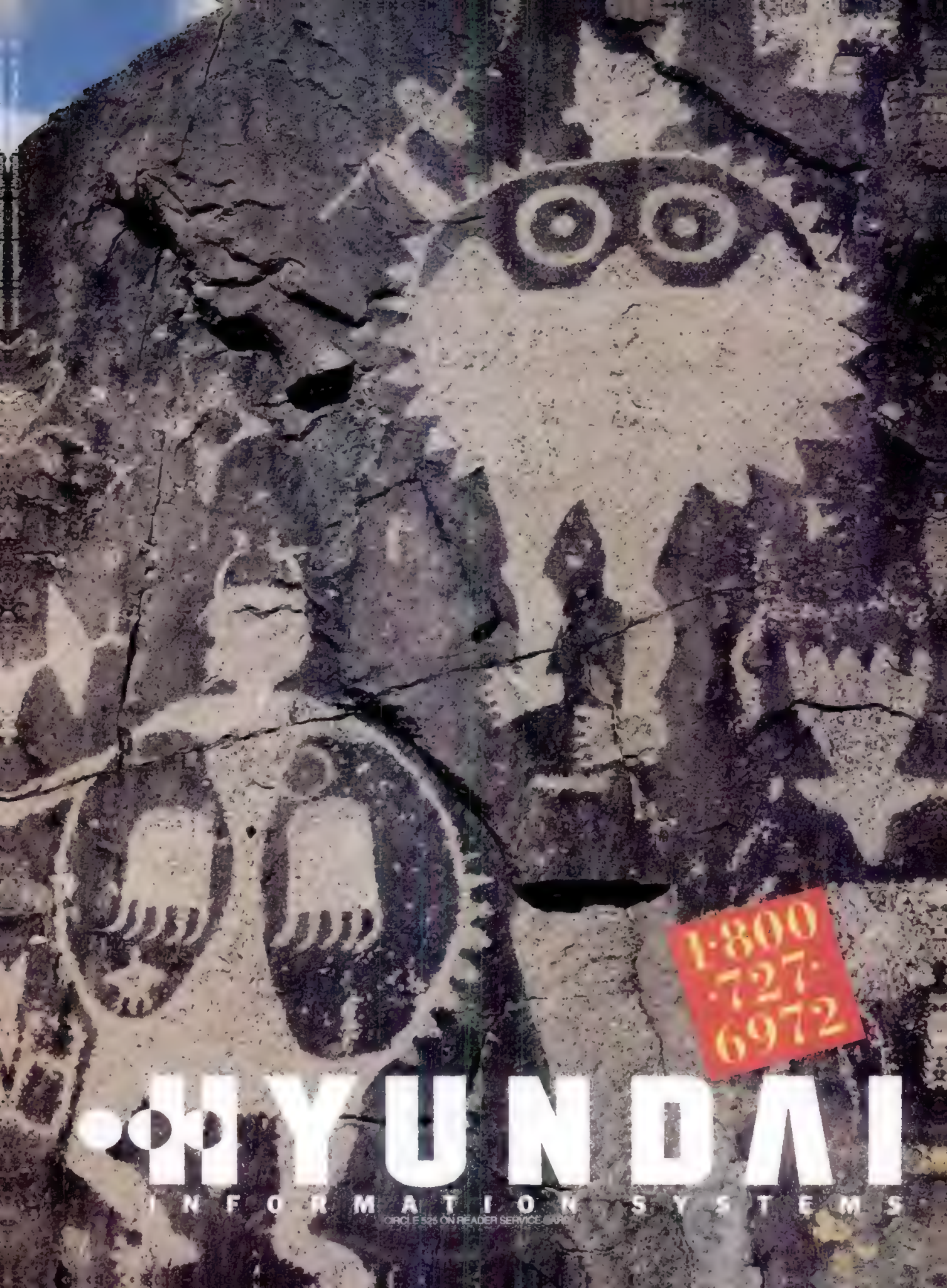
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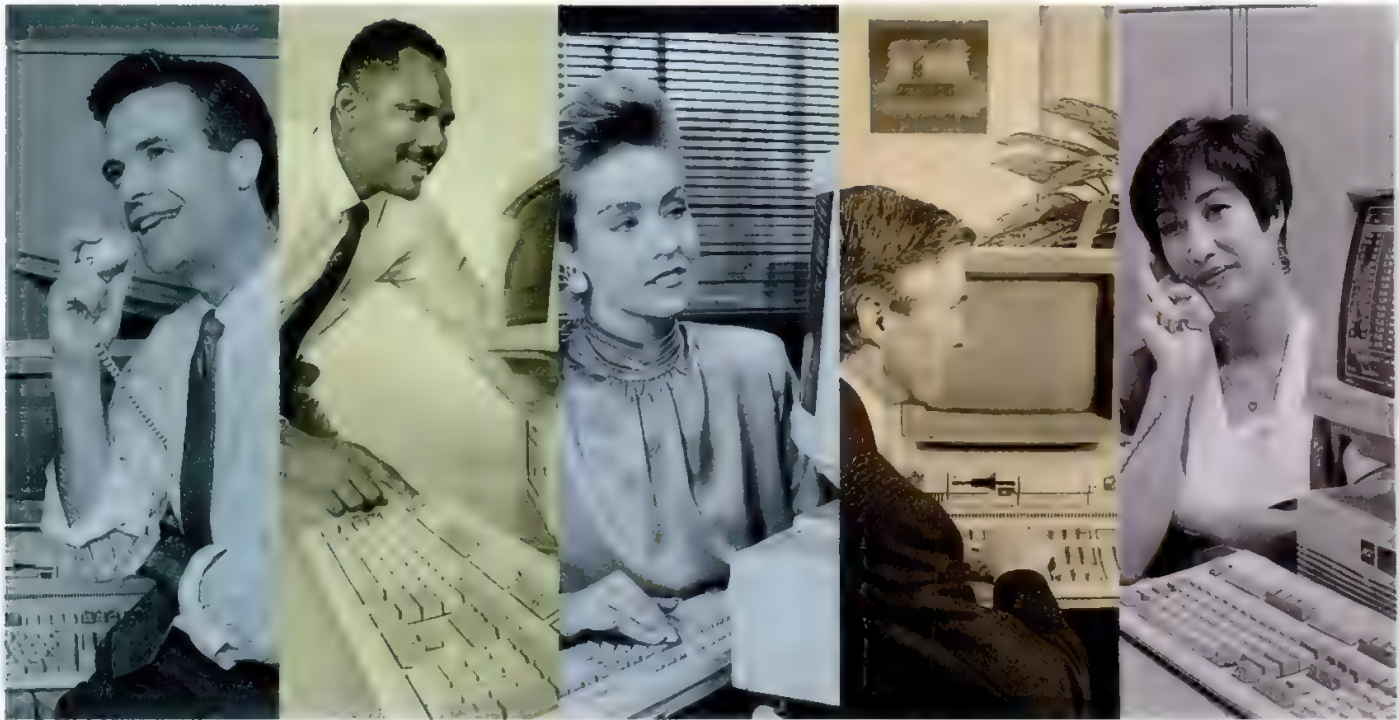
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Bill Machrone



When Bad Reviews Happen to Good Products

PC Magazine isn't infallible. Sometimes the best intentions and best efforts of all parties aren't enough.

Nobody likes being wrong. We do everything we can to defend against it. Our feature comparison reviews begin life many months in advance of the publication date. We generally know what product categories we want to review as much as a year in advance. Months before we begin the reviews, we reexamine our existing benchmark tests, often asking industry experts and manufacturers if our tests are still adequate and applicable. We write and debug new ones, if necessary. At the same time, we review the testing script, a book that can run to hundreds of pages, which tells the reviewers the tasks, tests, and observations they're to perform on each product. If it's a new category or if there have been major changes in the technology, a project leader in PC Magazine Labs writes a new script. We look at our original conception for the review, to see if it makes sense in the present market. We look for natural categories and subgroups.

When we've found the categories we want, we use various research techniques to locate the manufacturers.

Our comparison reviews attempt to find all the products that match the selection criteria. Occasionally, the number of products will be so large we have to select a subset. Sometimes even *PC Magazine* runs out of space.

The next step is to call the manufacturers and ask them to send us the current version of the product. The shipping and receiving operation at *PC Magazine* is probably the largest of any publication; we move roughly 4,000 products in and out through PC Labs each year. Once here, our technicians unbox them, affix inventory control labels, set them up, and subject them to preliminary tests. PCs, for example, are tested to make sure they match the manufacturer's spec. A fast crystal, a fiddled system clock, or ultrafast memory can make a difference in the benchmark test results. We send back anything that's out of spec.

For more-demanding products, our lab technicians perform all the benchmark tests to ensure consistency. Battery-rundown tests on

laptops are a good example of this. For others, our reviewers execute the benchmark tests as they review each product. Throughout the process, if we hit any snags, one rule prevails: Call the manufacturer. And things do go wrong. Installation programs bomb. Documentation is incorrect. Features don't work as they are supposed to.

Despite all our safeguards, problems sometimes slip by. You think you're doing everything right, the test results look plausible, but something's amiss. We don't find out until the issue is published. A manufacturer cries foul, or readers let us know that they're getting different results with the same product. Thanks to PC MagNet, feedback is instantaneous.

In one recent instance, we reviewed 2,400-bps modems. Three of them, the GVC, Practical Peripherals, and ViVa 24m, fared notably worse than the rest on our speed test. The fault was ours, not theirs. In retesting, all three of the products performed well. We either had the port speed set wrong or MNP 5 compression disabled. No one detected the discrepancy until we published the article. This is ancient history to our PC MagNet subscribers, who avidly followed the conversations between the



ILLUSTRATION SHANNON JEFFRIES

proponents of these products and our editors.

In a similar vein, we gave *COM-AND*, a shareware communications program, bad marks for its slowness with RTS/CTS flow control enabled. It turned out that the problem was not with the program, but with its obtuse documentation. You can't call the vendor with a problem if there's no reasonable way to find out that there is a problem. But readers experienced with the program were quick to point out our problem.

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Frank J. Derfler, Editor
PC Magazine, 1/15/91

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Bill Machrone

WHO YA GONNA CALL?

Letters to the editor are the usual way that vendors set things right. The Letters column has the advantage of being one of the best-read sections of the magazine, and it gives us the opportunity to let the vendor speak in his own words. Virtually every publication has a corrections and amplifications department, and we've got one, too. You've seen it—right at the end of the Letters column. There we address other errata that inevitably creep into an editorial product the size of *PC Magazine*. I mentioned before that we call the vendor when things go wrong. Readers want us to call the tech support line, so that we get the same kind of experience they do. Vendors want us to call the most senior person around, even the president of the company, so that they're sure the problem receives the proper amount of attention. The best results comes when we do both. If we start with tech support, as ordinary civilians, we get a pretty fair sense of what you're up against. If we get a bad answer, we kick it upstairs.

We've learned over the years that interaction with our readers, even more than with the vendors, has been the key to success. If you continue to tell us what we're doing right and wrong, we'll continue to do our utmost to serve you well.

IT'S A DATE

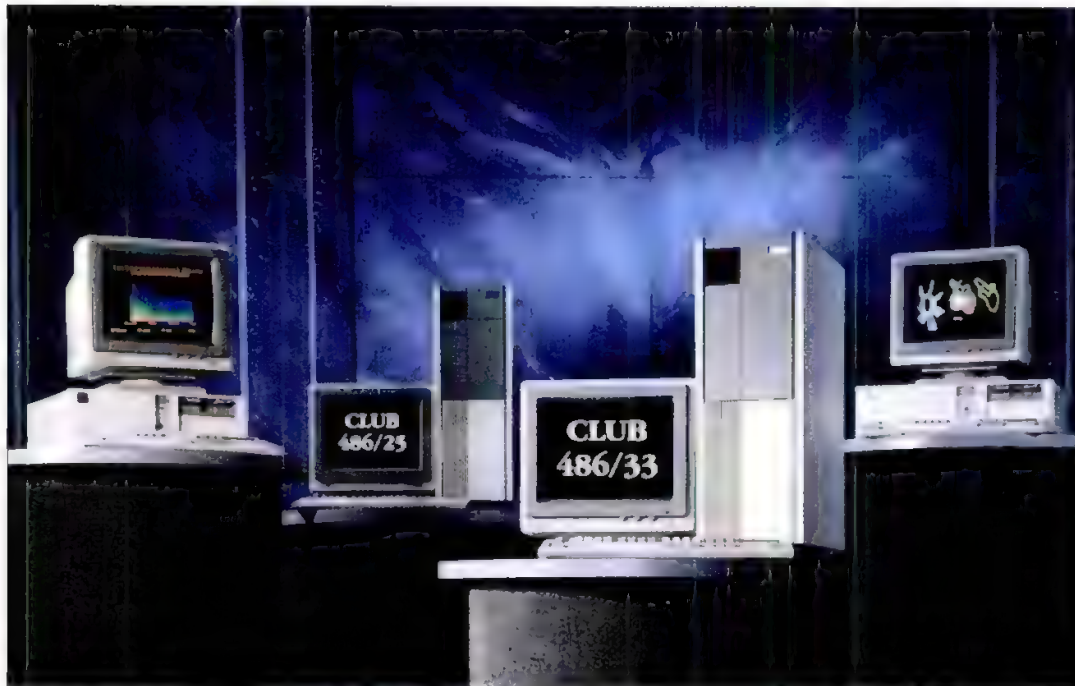
On another topic, I've gotten an unusual number of comments lately about the date you see on the cover of the magazine. One reader said, "It really ticks me off when magazines put those phony dates on the cover. They're trying to make you think that you're getting it really early or something." Others just expressed puzzlement. Let's set things straight: We're not trying to mess with your minds. The date on the cover is the *off-sale date* of the magazine. It's the last day that newsstand vendors need to display the issue on their shelves. After that, they can send unsold copies back to the distributor.

Someone else asked why we print the date in such large type in the table of contents. Too often, I hear people talking about "last month's *PC Magazine*," or "the January issue." We'd like to remind everyone that *PC Magazine* comes out *twice* a month, except in July and August, when it's monthly. ■

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Personal Workstation, Dec. 1990

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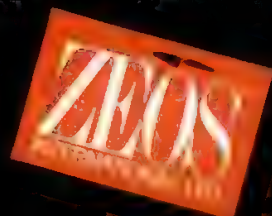
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John C. Dvorak



The Personal Computer will not be inexpensive, but as a second generation machine, it probably shouldn't be. With an IBM monochrome display, 64K of memory, printer, and two disk drives, a system will cost about \$4,500.—G. Michael Vose, Kilobaud Magazine, December 1981.

This year marks the tenth anniversary of the IBM PC, and as the end of the year approaches, we can expect a slew of personal reminiscences and sappy "looking back" columns, so I thought, "Let's be first."

Announced in August 1981, the IBM PC was shipped in time for 1981 Comdex. While IBM started the ball rolling for the second generation of personal computers, there were other contenders, and IBM's amazing success was not immediately realized or even predicted. One machine right on the heels of the PC was the Victor 9000, designed by Chuck Peddle—the man who in-

vented the highly successful Commodore PET. The Victor 9000 used high-density disks long before IBM, and it had a high-resolution screen that was phenomenal.

IBM's PC was probably one of the most sickly machines in the crowd. It was sold with 64K of memory, a cassette port, and a 180K disk drive. In 1981, CP/M users, running Z-80 machines (then considered flashy), had long since adopted hard disks, and many machines—including one collector's item made by John Deere—were using 1MB floppy disk drives.

My first encounter with an IBM PC was with George Morrow. Morrow, then a hotshot designer of CP/M machines and disk controllers, brought me to the now defunct ComputerLand in El Cerrito, California, to buy a PC a few days after IBM began shipments. Morrow had a deck of credit cards that he dealt like kings, queens, and aces to the bewildered salesman until he found one card that would "take" the \$5,000 or so that the system cost.

I was writing a newsletter at the time and was interested in Morrow's opinion of the computer, so I went to his lab and we dissected

a machine. Morrow was not impressed. Add-in cards were too long and too thick. It would cost too much to make them. When he found patches on the motherboard, Morrow concluded that this machine was going nowhere.

I hate to single out Morrow, because he wasn't the only nay-saying S-100 computer builder heavily burdened by a vested interest in CP/M and Z-80-based Altair clones. It seemed that most of the "experts" of the day didn't take the PC as seriously as they should have. A mere month before the PC was announced, Xerox, with all its paid expertise, announced the 820 desktop computer—a \$3,000 64K Z-80 dog.

Meanwhile, the Z-80-based Osborne 1, the Morrow MicroDecision, and the Kaypro were selling like hotcakes. And don't forget that the dominant player was Radio Shack with its TRS-80 Model I and Model III machines. Even the proprietary Apple II was more mainstream than the IBM offering. Fact is, the PC was an oddball machine.

We now know that IBM itself wasn't taking the machine seriously. But the company was serious about its distribution channels. I was told by a ComputerLand employee to get on

The Tenth Anniversary Of the IBM PC

Ten years ago, experts saw the IBM PC as an oddball machine that was going nowhere. So much for the experts.

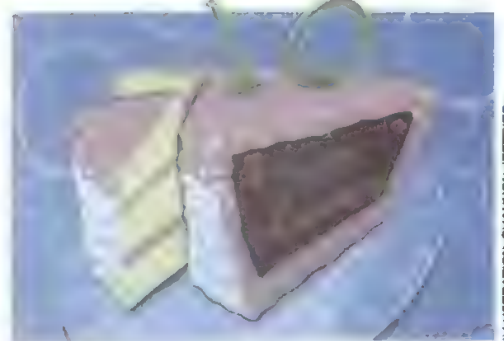


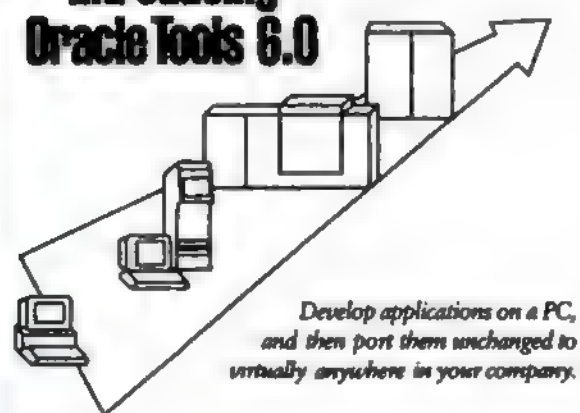
ILLUSTRATION SHANNON JEFFRIES

the IBM bandwagon because IBM was going into the stores and treating people well. At the time, Apple—the leading user of the dealer channel—was earmarked by a scornful arrogance, and apparently the IBMers were a welcome relief. The stores were going to do anything they could to help IBM do well against Apple and the small-time tightwad mentality exhibited by the CP/M computer manufacturers. That dealer attitude signaled a permanent change in desktop computing.

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Inside Track

One of the great phenomena of the 1980s was the emergence of VLSI houses, such as Chips and Technologies Inc. These companies

looked at add-in cards and motherboards full of chips and said, "Hey, we can put all that logic and support circuitry on a couple of VLSI chips!" This I like to call phase two of modern PC design. The great collapse in computer prices after the invention of the PC AT was largely due to these integrated marvels.

Of course, this concept didn't go over big with the companies that were banking on selling discrete components forever. Their coming solution brings us to evolution phase number three: recapturing the market with processor integration. Intel is leading the way with its so-called "Genesis" 386SL.

Intel decided that it could go one step further and sell processor chips with support circuitry built-in for a low price. The SL chip set is two chips: One chip has a 20-MHz 386, cache controller, memory management, and the AT-bus timing interface circuitry. The other contains the peripheral timers, interrupt controller, DMA channel circuitry, and parallel and serial ports, plus some power management hardware. You don't need much more except video, a floppy controller, and memory.

Intended for the notebook market, this "computer on two chips" is the trend to watch. Intel will do this with the 486 chip, too.

You have to wonder what the VLSI houses are going to do if their market erodes. I think that will mark phase four of the evolution in PC design. This stage will have the VLSI houses all designing clone or emulation RISC processors. It should be quite a mess in a few years.

While on the Subject of the 386/486 Dept.: These processors, unlike the 286, have a raw processor bus that can be accessed outside the processor and used for no-wait-state superfast I/O. Nobody currently takes advantage of this fact. Disk arrays and fast video would immediately benefit. Some engineers say that EISA uses some of the direct drive power of this bus, but not all of it. Engineers all say that if someone just hooked some sort of high-speed connector to this bus and standardized it through consensus (in the way the old S-100 bus was standardized), then we'd be looking at a new generation of high performance. We wouldn't need EISA or MCA. Ideally a machine with, say, three 386-bus connections and some ISA connectors (for those old modem cards) would be an extraordinary machine. Engineers at CompuAdd are rumored to be working on this idea.

Another Trend in the Wings Dept.: Advanced Logic

Research seems to have made the most hay with the write-back cache, but in an effort to eke out every ounce of per-

formance possible from fast new machines, every major desktop computer vendor is going to produce a machine with a write-back cache. Put simply, the write-back cache is a CPU caching technique that writes data through to main memory only when necessary.

I like to equate the concept with that of a disk cache/RAM disk combination. A disk cache is a moderator between the disk and the CPU. A RAM disk is RAM pretending to be a disk. If everything were on a RAM disk, you'd never need a cache; but with 600MB hard disks, this is impossible. But you can have some stuff on a smaller RAM disk for improved performance. Insofar as disk caches are concerned, a RAM disk is a write-back cache except that it doesn't function as a cache and has to be preloaded. I've heard of some flexible-size RAM disks that approach the write-back concept, but haven't used any.

Anyway, the write-back cache's design allows it to perform its function—at blazing full-tilt speed. Norm Towson at Mountain View-based Silicon Valley Computers says his 486-based machines using the write-back cache have returned benchmark test results that are unreal. They've been running benchmark tests on all the machines during 24-hour hot box burn-in and comparing them with numbers on standard cache machines. The

speeds achieved are higher than predicted. Isn't this what ALR has been saying all along?

I think of write-back as a great buzzword to use at trade shows. "When are you going to implement a write-back cache, Mr. Jenkins?!"

Genuinely Interesting Software Dept.: Finally, some company has released a CD-ROM that should be bought by every CD-ROM owner. It's called **Magazine Rack** and it's from Information Access (362 Lakeside Dr., Foster City, CA 94404; 415-378-5000). This gem of a disk costs \$89.95 and contains full text and abstracts from over 300 magazines published in 1990. There are 100,000 full-text articles on just about every subject you might be interested in. It includes all the back issues of *PC Magazine*, *PC Computing*, and *MacUser*, as well as *U.S. News and World Report*, *Cosmopolitan*, *Stereo Review*, and everything in between. It's an astonishing resource that would benefit any executive. There is over 825MB of full text compressed to fill up the entire CD-ROM capacity. The company will do one of these disks each year. It's a tremendous reference. ■

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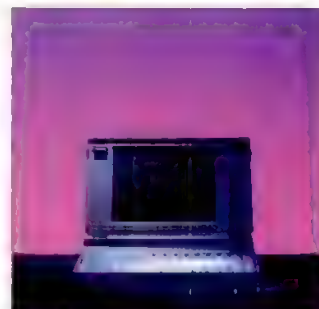
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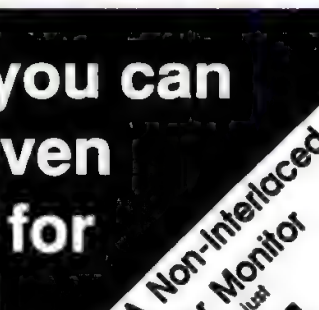
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Jim Seymour



Why Software Innovation Is Lagging

Substituting today's profits for an innovative tomorrow may leave the software industry with a bleak future.

Last time, I wrote how the nature of innovation in the software business has changed. Rather than seeing innovation expressed through the vitality and originality of lots of new products, and new *kinds* of products, our vision of innovation today is much smaller. Now we look at the incremental improvements in the newest release of a well-established program and call that innovation.

In an industry built upon innovation, that's not good news for users. More generally, that's bad news for those of us who rely on the ever-widening reach of PC power to provide those gains in productivity essential to remaining competitive.

I said last time that I'd pass along words of wisdom from leaders in the PC software business with whom I've been discussing this problem for the past six months or so.

But when I contacted them again to get their words into print, many shied away from being quoted. To a person, they

agreed that the scope and nature of innovation have narrowed, and they decried that. But many feared that acknowledging that in public would stir readers to doubt their companies' own products.

A few, however, thought the importance of this idea, and the intelligence of *PC Magazine's* readers, justified speaking out.

Mike Coupland, who heads Corel up in Ottawa, points out that bundling a number of utilities with a mainstream software package, under the name of that package, conceals the number of new programs coming to market. *CorelDRAW*, for example, includes a superb autotracing program, a font-conversion program, and more than a hundred PostScript outline fonts in its basic package. Not long ago, those would have been sold separately.

"That's good for the end user," Coupland says, "because instead of a few thousand copies of these utilities getting out there, tens or hundreds of thousands of copies ship."

Coupland also points out that innovation sometimes lies in packaging—in the best sense

of that tortured word—rather than in technical wizardry. The new CD-ROM release of *CorelDRAW*, for example, adds over 4,000 pieces of uncompressed clip art. That makes it much easier to preview and use the clip art directly, without worrying about how much of it to install on your hard disk.

And Coupland points out that changes in typical PC hardware configurations have lessened software publishers' interest in such technical innovations as making program code smaller. "If someone came in the door and said he had a way to pack our code into half as much space, that wouldn't be nearly so interesting now as it would have been a couple of years ago," he says.

Dan Bricklin, coauthor of *VisiCalc* and longtime PC-software visionary, also points to the importance of available hardware in shaping the kinds of innovation possible in new software. "We haven't had many real innovations in PC hardware," he says. "Since the introduction of the IBM PC a decade ago, the only important hardware innovations have been the laser printer and networks—and those *really* changed software."

Bricklin, now with Slate—the "pen-PC"



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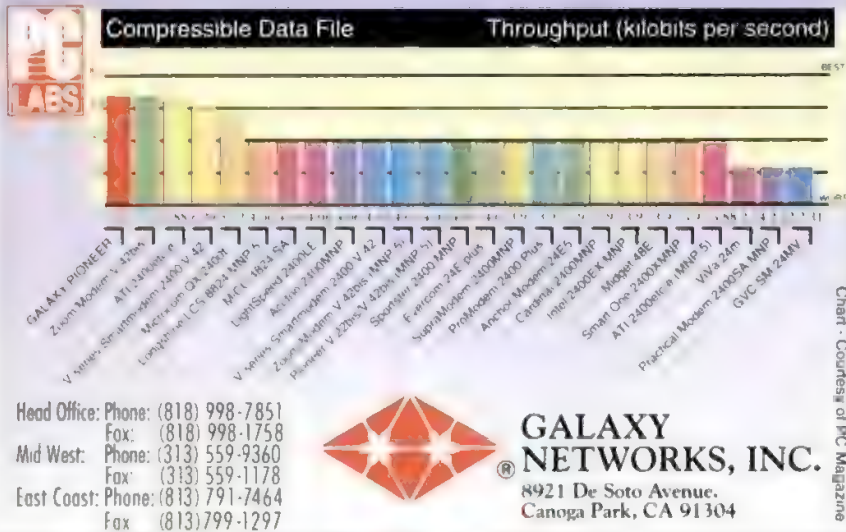
company, thinks slate-style PCs will be the next hardware to spur software innovation.

He also points out that the horizontal-software marketplace is now so hard to break into—because of the dominance of such giants as Lotus, Microsoft, and Borland—that many innovative software developers are focusing on vertical-market programs.

"Before, everyone tried to play the same game," Bricklin says. "But now the vertical

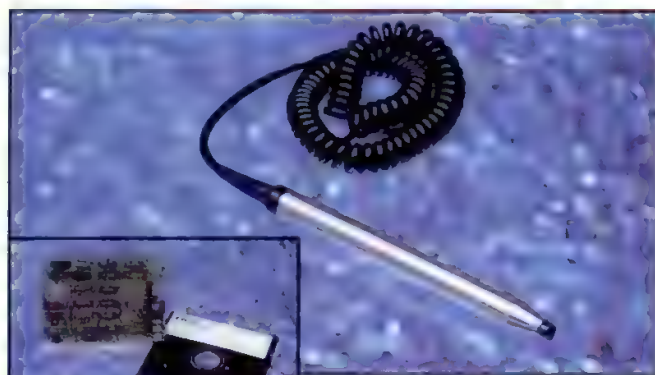
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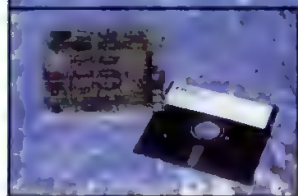


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markets have gotten big enough that you can make a fortune in them. So a lot of developers are deciding that's a safer, more interesting game to play than trying to knock off the leading word processors, spreadsheets, and so on."

Al Merrill, at diagnostic-utility publisher Merrill & Bryan, brings a small-company perspective to the software-innovation blues. "The reasons we're not seeing more innovation," he says, "are the emergence of more sophisticated users and the enormous size of the market."

"Now you have to find out what people want, then go build that, instead of dreaming up new products, building them, then seeing if anyone wants them." Merrill uses an informal kitchen cabinet of beta testers as a screen for new-product ideas: *Do you want this or this? What would you be willing to pay for it? What features need to be included in it?*

Of course, one problem in asking people what new things they want is that our imagination is limited by what we already know. Visionaries and oddball new ideas get shunted aside in a system bound too closely to asking people what they want: We dream too-small dreams.

NO INVESTMENT IN THE FUTURE

Gordon Eubanks of Symantec worries about the division of resources in the business between enhancing what we already have and, to paraphrase George Bernard Shaw, imagining that which has never existed and asking "why not?"

"It's all a matter of balance," Eubanks says. "We're clearly into a period in PC software of *evolution*, not *revolution*. And that's good for customers. You can't leave your customers behind as you innovate."

"But remember Steve Jobs' line about how somebody has to be reinventing the wheel while others are manufacturing wheels. It always takes a new company to conceive the real next-generation products."

Eubanks is right; it's a delicate balance. Today, the riches of the marketplace are holding back innovation at many PC software companies. They want to gobble up the fruit that has fallen to the ground before reaching for the sky again.

That may be a good strategy for the moment, but it's a lousy way to invent the future. ■



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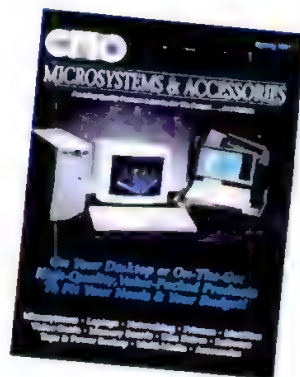
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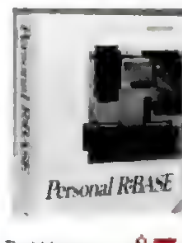
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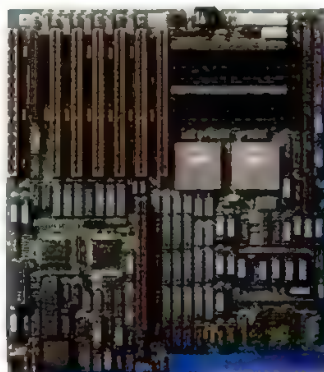
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For a Good Time, Call 1-900-SUPPORT

900 numbers may be good for New Kids and Ninja Turtles, but there are better ways to provide product support.

It's not *quite* as bad as copy protection, but it comes close. And it has replaced copy protection as the major self-serving fantasy of arrogantly large (or small, pathologically self-destructive) software vendors.

What is "it"? Why, the use of 900 numbers for (so-called) "software support," of course. I have no idea why any software vendor thinks that the telephone "innovation" that brings us dial-a-porn and taped conversations with Teenage Mutant Ninja Turtles is a great vehicle for run-the-meter software support. This crackpot scheme is accompanied by the most miserable collection of bogus "it's really for the good of the user" rationalizations I've heard in a long time. Remember when they used to say that about copy protection?

The justification for this nonsense is based on an obvious fact: It costs software vendors money to support their products. The argument moves from there to a

less obviously factual assertion: Users must pay for the support of the software products they buy—one way or another.

That last "fact" is seductive, because in one sense it is undeniably true. Software vendors obviously must have income in excess of their expenses if they are to stay in business. Money spent by users to purchase a software vendor's products must therefore exceed funds spent by a vendor in making and selling those products. Providing support is a cost for the vendor, and revenue from users of the product must be sufficient to cover that cost—along with all of the vendor's other costs. So in this broad sense it is correct to say that users must pay for support one way or another.

But we can just as readily say that users must pay for the advertising of the software products they buy—one way or another. For that matter, we could also say that users must pay for trade show attendance by the software vendor, for the vendor's corporate jet, and for the silver water pitcher that graces the vendor CEO's desk.

All that is true enough. All that is also false. For there is another sense in which users don't pay for any of those things. We pay for the product, but we don't pay for it unconditionally. We fork over our cash if and only if we want the product enough to pay the price asked for it. It isn't *our* problem how much the vendor spends on the product—that's the vendor's problem. All we care about is whether we like the product enough to spend the money required to buy it.

Suppose a vendor decided to sell a product for a given price—and then added a surcharge for public relations and advertising. How would that go over with customers? Why should added costs for support be any different?

SUPPORT REQUIREMENTS VARY

To be fair, maybe we ought to grant that support is different in at least two important ways. First, support is a continuing requirement for many (if not most) users. Second, support is a variable requirement from one user to the next. Some users require a lot of support. Others need little or none. Those who do need support may continue to need it long after the initial learning period, espe-



ILLUSTRATION: SHANNON JEFFRIES

cially if the product is a complex one.

It may be, therefore, that a vendor's support costs vary from one user to the next in a way that other costs don't. If users make lots of calls seeking help, the vendor will have to spend more on support, and so vendors can't control support costs directly the way the vendor can control other costs. Right?

Wrong. A vendor's support costs aren't really as different from other costs as they first

William F. Zachmann

appear. Vendors are no more at the mercy of the users in regard to support costs than they are with many other costs. Consider advertising.

A vendor's advertising cost per product varies due to the actions of users in

much the same way that support costs fluctuate. Whatever the advertising strategy and budget may be, the advertising costs per unit sold will decrease if lots of users buy the product. So users' actions in buying (or not buying) the product do affect the vendor's advertising cost per unit sold. Nevertheless, it is really the vendor's choices rather than the users' actions that make the critical difference.

If the product is not desirable, if the ads are poorly executed, if they are placed in magazines that nobody reads, or if the product is overpriced, it's hardly the users' fault that advertising costs per unit sold are high. The users' actions play a part only in response to what the vendor chooses to do.

Master T. T. Liang, my old t'ai chi ch'uan teacher, always said that if someone pushes you over, it is not their fault that they pushed you over; it's your fault that you didn't neutralize the push. If users don't buy a product, it isn't their fault. It is the vendor's fault for not having designed or sold it properly.

GOOD DESIGN KEEPS COSTS DOWN

Product support isn't fundamentally any different. The need for support for a software product is just as much under the vendor's control as is the basic desirability (hence marketability) of the product in the first place. A well-designed and well-documented product with good on-line help ought not to need a lot of support, anyway. The best way for a vendor to keep support costs down is to design the product properly from the start. That will minimize the need for support calls from confused, frustrated users.

A vendor can also use more efficient means to support products than simply to have a battery of expensive technical people manning telephones. Any vendor can readily set up a dedicated bulletin board system, for example, for just a few thousand dollars. That makes it possible to use tech support people far more effectively. Users themselves will help other users on a BBS as well.

Alternatively, vendors can (and do) provide on-line support on public services such as CompuServe. There is a cost to the user for such services, and a chance for the software vendor to gain some income from them. But there is only a basic cost for using such services. There is no incremental cost of support for a particular product. The whole thing is far less intrusive and more desirable than a directly metered software support charge.

Software support charges, like copy protection, are rightly perceived by users as an undesirable product feature that clearly doesn't benefit the user. Software vendors will be much better off if they leave 900 numbers to the fantasy sex crowd and recover support costs the way they do any other cost: in the basic prices of their products. ■

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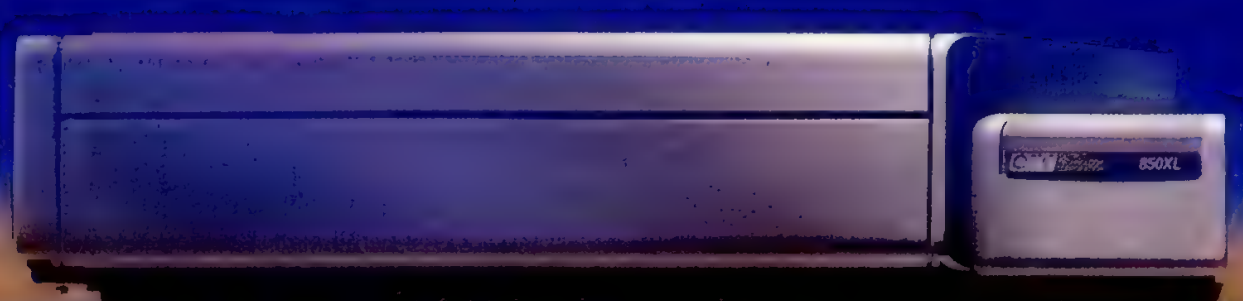
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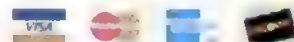
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Another thing you get with PixL Perfect monitors is our universal switching-mode power supply. It automatically

adapts to any voltage from 90 to 260, without changing transformers.

And our two-stage line-filter circuitry tops FCC regulations and EMI for magnetic emission. That makes our new monitors safer for people, safer for other equipment.

Perfect Is As Perfect Does.

But what is it like to work with monitors that are PixL Perfect?

Take resolution. To see exactly how good we look, just check the chart below.

MODEL:	9C-438V	9C-439VS	9C-438VX
CRT/Dot Pitch:	14" 0.28	14" 0.28	14" 0.28
H. Frequency:	31.5 KHZ 35.2 KHZ 35.5 KHZ	31.5 KHZ 35.2 KHZ 35.5 KHZ	31.5 KHZ 35.5 KHZ 48 KHZ
V. Frequency:	43.5 HZ 60/70 HZ	43.5 HZ 60/70 HZ	72 HZ 60/70 HZ
Resolution in Pixels:	1,024 x 768	1,024 x 768	1,024 x 768
Compatibility:	IBM 8514/A APPLE MAC II	IBM 8514/A	IBM XGA (FLICKER FREE)

The more pixels (dots) on the screen, the higher the resolution and the sharper the display.

What's more, our dark-tinted, non-glare face gives you clear, crisp colors while cutting reflections.

You also get your choice of CRT coatings with Samtron. For greater scratch resistance, choose our hard, chemically etched finish. Or for the sharpest possible display, our silicon coating.



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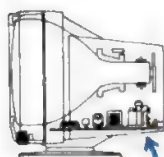
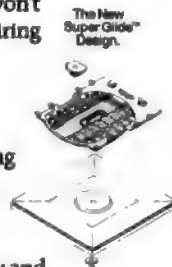
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MAINSTREAM MONITORS

What Really Matters



It's politically correct to worry about monitor emissions. But it's ergonomically correct to pick a noninterlaced monitor with a high refresh rate. PC Labs scrutinizes 22 Super VGA monitors for image quality, performance, and comfort.

by Winn L. Rosch

Super VGA is practically free, or so the story goes, when you buy a new graphics adapter or a PC with built-in display circuitry. Monitors are another matter, however. Super VGA requires a particular—and more expensive—kind of display. The electronics in a Super VGA monitor need a wider bandwidth and the ability to accept higher-frequency synchronizing signals; in addition, they require picture tubes with a

UNDERSTANDING YOUR MONITOR: A Guide to Video Terms

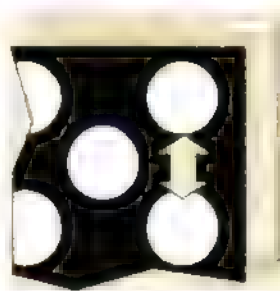
AUTOSIZING True autosizing occurs when a monitor can maintain a constant image size across different video modes. Many manufacturers use mode sensing and preprogrammed factory settings to achieve the same effect across chosen display standards, such as VGA and Super VGA. Some manufacturers also provide user-determined settings.

BARREL DISTORTION Barrel distortion is the inverse of pincushioning. Instead of curving in, the on-screen image bows out, resembling a barrel.



CONVERGENCE Theoretically, the three electron beams should converge at appropriate distances from one another. When the beams equally excite all three color dots and the distance between beams is

perfect, the resulting color is pure white. Serious deviation from this kind of precise spacing is called poor convergence. It can cause white pixels to show bits of color and can also decrease picture sharpness and resolution.



dots are on-screen. The smaller the dot pitch, the finer the image's "grain." Some color monitors, such as the Sony Trinitron, use a slot mask (also known as an aperture grille) instead of a shadow mask. A 14-inch Super VGA monitor should have a dot pitch of no more than 0.31 mm.—about 80 dots per inch. (Monochrome monitors do not use a shadow mask and therefore do not have a dot pitch.)

DRIFT See *swim*.

HORIZONTAL SCANNING FREQUENCY

Sometimes called horizontal sync, this frequency describes how often the monitor draws a single scan line. Horizontal scanning frequency is measured in kHz, meaning that thousands of lines are drawn each second. VGA horizontal scanning frequency is standardized at 31.5 kHz, while this frequency for Super VGA ranges from 35 to 48 kHz, depending on the vertical refresh rate of the graphics adapter.

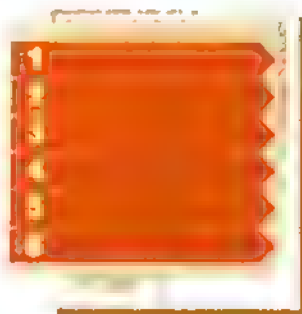
DOT PITCH Dot pitch describes the distance between the holes in the shadow mask; it indirectly describes how far apart the individual



INTERLACED AND NONINTERLACED SCANNING

There are two schemes for painting an on-screen image: interlaced and noninterlaced.

Interlaced scanning takes two passes, painting every other line on the first pass and sequentially filling in the rest of the lines on the second pass. Noninterlaced scanning paints all the lines in one pass and then paints an entirely new frame. Noninterlaced scanning, while more expensive, is preferable because it reduces screen flicker.



JITTER See *swim*.

PINCUSHIONING Pincushioning alters the shape of on-screen images, making them appear concave. For example, the sides of a pincushioned rectangle bend inward, as if someone were poking the image from off-screen. The opposite effect, when the image bows out, is called barrel distortion.

sharper dot pitch. Consequently, Super VGA monitors are naturally more expensive than those that follow only the VGA standard.

If you want to see Super VGA quality on your screen, but your budget is tight, the 22 products in this review are among the least expensive Super VGA monitors you can buy. Prices range from the truly affordable (the \$550 TW Casper TM-5158) up to the moderately expensive (the \$1,149 Sony CPD-1304 Multiscan HG). All are compact multiscanning color sets and have a diagonal screen width of either 13 or 14 inches.

SMALL BUT POPULAR

According to the most recent study published by Stanford Resources (an indus-

try-research firm based in San Jose, California), multiple-frequency monitors (which include multiscanning and multiple fixed-frequency units) make up more than one-third of all personal computer displays now sold. The overwhelming majority of those monitors have screens smaller than 15 inches. For example, of the products made by NEC Technologies, which markets more multiscanning monitors than any other company, a full 84 percent of those sold in the fourth quarter of 1990 had 14-inch screens. Only 16 percent were equipped with 16-inch or larger screens.

Underlying the popularity of small-screen Super VGA monitors is their cost. In the NEC line, for example, a 2-inch jump from the 14-inch MultiSync 3DS to

the 16-inch MultiSync 4D will cost you about a third as much as the Multi-Sync 3DS. (The \$1,499 MultiSync 4D has a street price of about \$950, compared with the \$1,049 MultiSync 3DS, which has a street price of about \$600.)

But the larger screen adds considerable value. The jump from a 14-inch to 16-inch screen adds about 30 percent more area. (Going from a 14-inch to 17-inch screen gives you 50 percent more area.) This extra real-estate boost is especially important for higher resolutions, which demand at least a 17-inch display.

The trend toward larger monitors certainly lies ahead. Manufacturers are already shifting their concentration from smaller screens to the 16- and 17-inch variety, which promises to become the

MONITORS

SUPER VGA MONITORS

PIXEL A pixel is the smallest information building block of an on-screen image. On a color-monitor screen, each pixel is made of one or more triads. Resolution is usually expressed in terms of the number of pixels comprising the width and height of a complete on-screen image. In VGA, the resolution is 640 by 480 pixels; in Super VGA, it is 800 by 600 pixels.

ROPING Roping describes an image distortion that gives solid straight lines a helical or twisted appearance. This problem is caused by poor convergence.

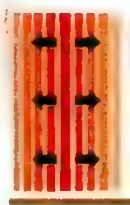


SHADOW MASK The shadow mask lies just behind the screen. It is drilled with small holes, each of which corresponds to a triad.

The shadow mask helps guide the electron beams so that each beam hits only one phosphor dot in the triad.

SLOT MASK The slot mask, also known as the aperture grille, serves the same function in a Sony Trinitron picture tube as a shadow mask in a conventional picture tube. The slot mask is made up of vertical wires stretched behind the screen. The spacing of these wires (or the slots between them) determines the finest detail that the monitor can horizontally display. The dot pitch for Trinitron monitors measures the space between these slots.

SWIM An image should be rock-steady on your screen. Swim, like the similar characteristics jitter and drift, is a measure of how much an on-screen image wavers over a given time. PC Magazine Labs' Microvision Superspot 100 testing apparatus measures swim in 30-second periods. Jitter is the measure of short-term variation (over a 15-second interval), and drift is the measure of long-term variation (over a 1-minute period).



TRIAD A triad contains three phosphor-filled dots—one red, one green, and one blue—arranged in a triangular fashion. Each of the three electron guns is

dedicated to one of these colors (for example, the red gun excites only a triad's red phosphor dot). As the guns scan the screen, each active triad produces a single color, which depends on the combination of excited color dots and how active each dot is.



VERTICAL REFRESH RATE OR VERTICAL SCANNING FREQUENCY The vertical refresh rate, sometimes called the vertical scanning frequency, describes how often the monitor paints a complete screen (or refreshes the screen). Vertical frequencies are measured in Hz. Higher vertical frequencies are associated with less flicker. Standard VGA has a vertical frequency of 60 Hz or 70 Hz, and Super VGA vertical refresh rates vary from the VESA manufacturers' guidelines of 56 Hz (which is about the tolerable minimum) and 60 Hz to the official standard of 72 Hz.

VIDEO BANDWIDTH Video bandwidth represents the highest input frequency a monitor can handle; thus, it determines the resolutions of which a display is capable. Video bandwidth is measured in MHz.

next mainstream desktop display. (For more information, see "16-Inch Monitors: Sized for Super VGA," *PC Magazine*, March 26, 1991.)

COMING TOGETHER

While technological debates rage in the 16-inch-and-above arena, small-screen Super VGA monitor designs have become unusually stable, thanks in large part to the Video Electronics Standards Association (VESA). An organization comprised of graphics adapter manufacturers and monitor makers (among others), VESA hammered out standards for Super VGA signals. (See the sidebar "Standardizing Super VGA: The Role of VESA.")

VESA has been successful in helping

assure the compatibility of graphics boards with both software and monitors at 800-by-600-pixel resolution and has contributed an easy-on-the-eyes 72-Hz vertical refresh rate. VESA's Super VGA standardization also promises a new entry at the lower end. A low-cost monitor should develop, one capable of locking to VGA signals, Super VGA signals refreshed at the VESA standard rate of 72 Hz, and the soon-to-be-popular 1,024-by-768 resolution. Such multiple fixed-frequency displays will most likely be priced somewhere between multiscanning monitors and ordinary fixed-frequency VGA. Once manufactured in volume, they should be the leading alternative to today's midrange multiscanning monitors. For now, however, the choice is still between the main-

stream small-screen Super VGA display, and the new 16-inch contenders.

WHERE THE PRICE IS RIGHT

This upward trek is not just a search for quality. It is also a way of keeping ahead of the competition. At the low end of the market, where price overrules every other buying consideration, single fixed-frequency VGA-only monitors reign. According to Stanford Resources, two-thirds of all monitors sold fit this bottom-end class, which includes digital monitors that stick with bygone display standards—the Monochrome Display Adapter (MDA), the Color Graphics Adapter (CGA), the Hercules Monochrome Graphics Adapter (MGA), and the Enhanced Graphics Adapter (EGA). (For more information

MONITOR EMISSIONS: Should You Worry?

Although the scientific community has yet to reach a consensus about the potential health risk caused by monitors, the industry has taken matters into its own hands by delivering a slew of low-emission displays. The best news is that they do not cost any more than traditional monitors.

by Winn L. Rosch

Now that you know how to make your monitor easy on your eyes, consider the rest of your body. After all, making a visual improvement is easy. Just opt for a 16-inch or larger screen so you can see all the details of your Super VGA images. Insist on noninterlaced displays with high vertical refresh rates at higher resolutions to eliminate flicker: Look for 70 Hz for VGA and the official VESA standard of 72 Hz for Super VGA. And a monitor with an etched or coated display minimizes glare and cuts back on headaches.

Safety for you and your family is another issue entirely—and a tricky one indeed. Monitors emit electromagnetic radiation when the electron beams paint the on-screen image. Some studies have indicated that there may be a link between monitor use and elevated cancer rates, eye stress, abnormal pregnancies, and miscarriages. Although the scientific community has yet to come to a consensus on what—if any—dangers exist, several monitor manufacturers have begun marketing products as low-emission models.

SWEDISH STANDARDS

The question of how the video display terminal (VDT) affects our health is not new. Since 1986, Sweden's National Board for Measurement and Testing (MPR) has published a set of standards. The Swedish standards, based on measurability rather than on medical evidence, were revised and made even more strict earlier this year. The new test procedures reportedly include a wider

range of emissions under examination.

Recent consumer concerns stem in part from one study conducted in 1988. After observing 1,583 pregnant women in a study of environmental hazards, the Northern Kaiser Permanente Medical Care Program (Oakland, California) found a correlation between an increased rate of miscarriages and using VDTs for more than 20 hours per week during the first trimester of pregnancy. But more-recent experiments have raised questions as to whether the miscarriages were caused by the signals that monitors emit or by some other factor, such as stress.

A 1989 University of Toronto study showed no association between miscarriages in mice and some of the signals that are characteristic of VDTs and monitors. This year, a study published in the *New England Journal of Medicine* by principal researcher Tim Schnorr showed no difference in miscarriage rates among telephone company workers with similar jobs to those of the VDT workers in the Kaiser study. Moreover, the Kaiser study itself notes that the jobs associated with VDTs (and the stress that they cause)—rather than the VDT signals themselves—might have been the cause of the miscarriages. Take all this into account and the claims of reduced monitor emissions might seem irrelevant.

ELF VS. VLF

The way in which higher-frequency radiation harms cells is well understood, and scientists now agree that higher-frequency radiation is dangerous. But

how low-frequency radiation effects cells is still not known.

The mechanism by which a VDT displays on-screen images generates electric and magnetic fields in what are called the extremely low frequency (ELF) and very low frequency (VLF) bands. All of the recent studies that have given monitors a clean bill of health examined only VLF radiation. VLF signals, which range from 3,000 to 30,000 Hz, are emitted primarily by the deflection yokes of monitors, television sets, and VDTs.

But monitors—and nearly all electrical devices—also emit fields in the ELF range of 30 to 300 Hz. ELF signals have been associated with a variety of health effects, both in laboratory experiments and epidemiological surveys. The experiments associated cancer promotion, changes in biological clocks, and alteration of nerve-cell physiology with ELF fields. The epidemiological studies have associated increased cancer rates with people living near power lines and using electric blankets, both of which have copious electrical and magnetic ELF fields. (In a 1989 background paper prepared for the Congressional Office of Technology Assessment, Carnegie-Mellon University summarized a large number of these studies.)

The ELF fields are strongest primarily behind rather than in front of the monitor screens. Whether these fields are truly dangerous remains disputed, although the Environmental Protection Agency admits it may be a possible but not proven cause of cancer in people.

However, the fields emitted by even the worst monitors are minuscule when compared with those found around power lines and distribution transformers. A block away from a power station, ELF fields may be a hundred times stronger than a couple of feet in front of even a poor-quality monitor, according to measurements made by PC Magazine Labs.

To date, the studies of the health effects have not answered the nagging questions of what may constitute a safe or unsafe level of ELF. Moreover, it is not known whether the effects of ELF are cumulative. Studies published in

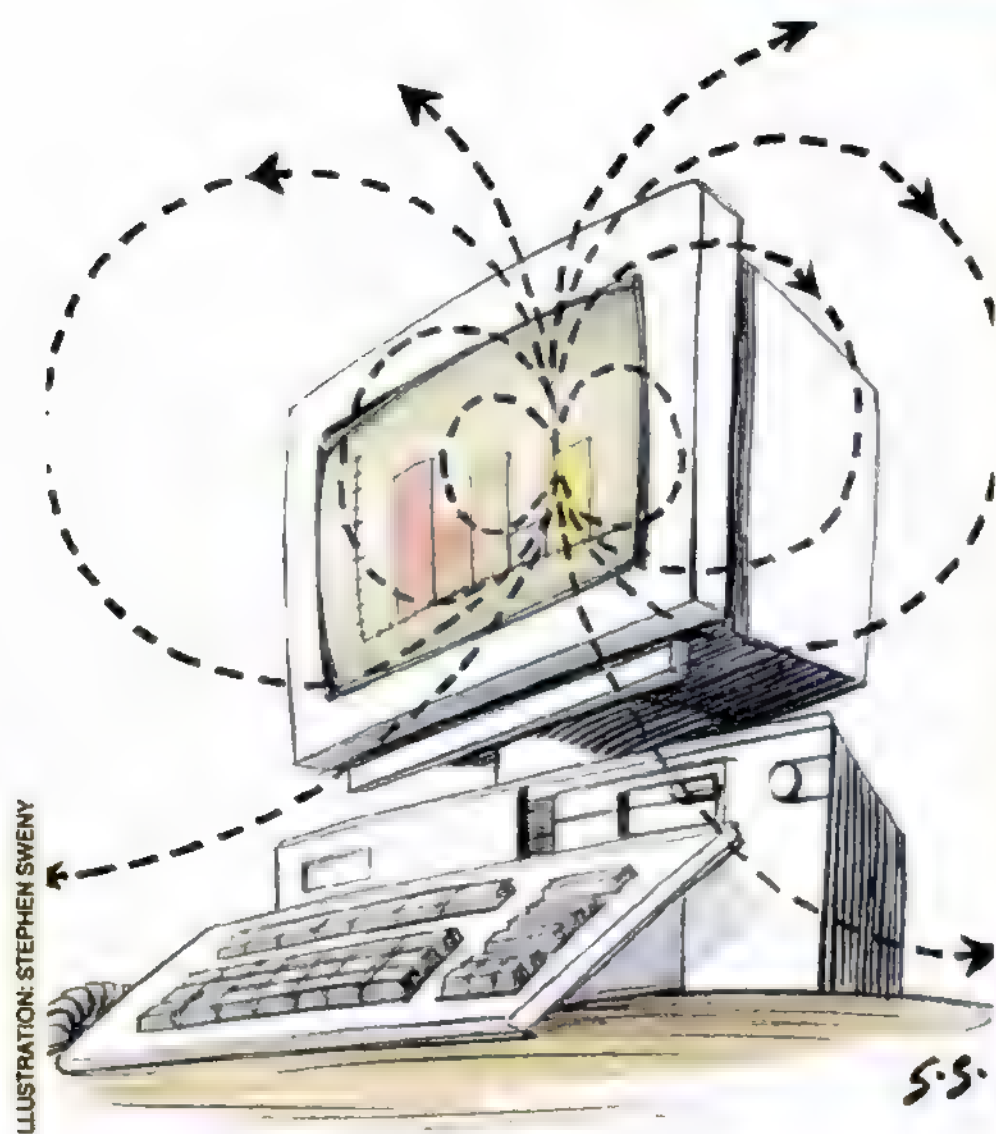


ILLUSTRATION: STEPHEN SWENY

Super VGA monitors reviewed in this article, three are marketed as low-emission units: the Hitachi/NSA 14MVX/LMF, the Iiyama Idek MF-5015A, and the NEC MultiSync 3DS. These low-emission models cost the same as their traditional counterparts.

And indeed, they do produce lower emissions: In informal testing, PC Magazine Labs found that the NEC MultiSync 3DS produced half as much ELF as the NEC MultiSync 3D and only 5 percent of the VLF that the MultiSync 3D produced.

But how low is low enough? We just don't know. To date, there is no hard evidence about what constitutes safe or unsafe levels of electromagnetic radiation. The best advice may be to make your next monitor purchase a low-emission model. After all, it won't cost you any more to play it safe.

In addition to the low-emission monitors reviewed here, the following companies market low-emission displays: American Mitac Corp. (800-648-2287); AOC International (USA) (816-891-8066); Compaq Computer Corp. (800-231-0900); Copam USA (415-623-8911); Cordata Technologies (213-603-2901); Cornerstone Technology (408-435-8900); IBM (800-426-2468 for local dealer); IOcomm International Technology (213-644-6100); JVC Information Products Co. of America (408-988-7506); Qume Corp. (408-942-4000); Sigma Designs (415-770-0100); Taxan America (408-946-3400); and TVM Professional Monitor Corp. (714-985-4788). Low-emission upgrades for \$75 are offered by CTX International Inc. (714-595-6146).

Additional research for this story was done by editorial assistant Susan Paige York.

Radiation Research in 1982 and *Bioelectromagnetics* in 1985 even suggest that ELF signals have biological effects only at certain specific (but undetermined) levels. Other researchers have disputed the theory.

The safest strategy is probably the most cautious one. Minimize your exposure. The University of California at Berkeley Wellness Letter (P.O. Box 420148, Palm Coast, FL 32142) recommends the following precautions: Sit at least 28 inches (about an arm's length) away from your computer screen; sit at least 4 feet from your coworkers' monitors; turn your monitor off whenever you are not using it. (There is no value in dimming the screen because brightness does not effect the monitor's emissions.)

LOW-EMISSION MODELS

Playing it safe has never been so easy. Spurred on by the increasing concern in Europe and in San Francisco (where legislation was passed late last year that established ergonomic standards for offices and set up a committee to investigate monitor emissions), many monitor vendors have begun marketing models here in the U.S. that claim to meet the Swedish standards. Of the 22

on VGA monitors, see the sidebar "The Case for VGA-Only Monitors.")

This part of the market is awash with products. But prices here are as low as they will go. You can now find color VGA displays (some of them of dubious quality) for less than \$250. Further price cuts from there are unlikely.

Faced with a stratified price frontier, the big manufacturing giants are setting their sights on the small-size multiscanning VGA/Super VGA monitor market. The market leaders for this product category right now are IBM and NEC, sharing about 43 percent of the market. Packard Bell holds nearly a 10 percent market share, with Tatung Co. of America (7 percent) and GoldStar Technology (6 percent) close on its heels. Panasonic Communications & Systems Co., Samsung Information Systems America, and Samtron are also contenders with a 5 percent market share each.

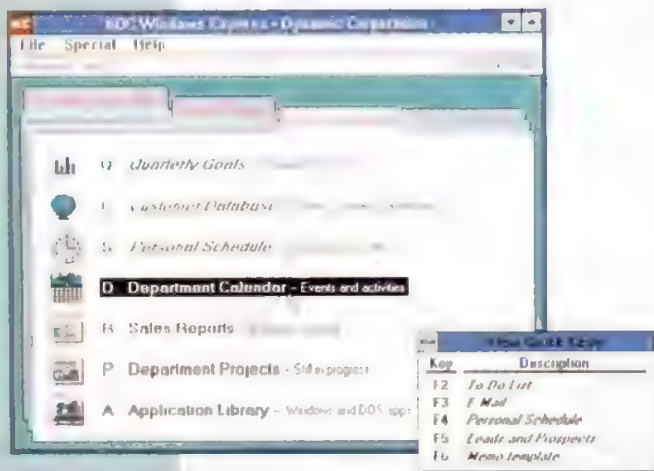
With the entrance of some of the huge electronics mass-manufacturers into this category, prices for small-screen multiscanning displays are sure to fall—although not below the price of a VGA monitor. Most monitor makers are now devoting their attention to what they see as the primary growth area: those 16-inch and larger screens. If you buy a small-screen multiscanning display (such as the ones reviewed here) now, you can get a good deal. You might get a great deal farther down the road, but if you are looking for technological advances, they're happening at the 16-inch-and-above screen size for the most part.

Take a look at the product line-up for this review and you will see a lot of familiar faces. Manufacturers have little need and less desire to upgrade these products. For example, Sony introduced its CPD-1304 Multiscan HG two years ago, and NEC's MultiSync 2A came on the market nearly three years ago.

SAFETY CONCERNS

You will still find a few new ideas and changes in the monitors reviewed here, although the innovations may not appear on the screen. The most significant change is a subtraction rather than an add-on: emissions. With the growing awareness of low-frequency electrical and magnetic fields, monitor makers are reducing the fields emitted by their products. For example, NEC's current lineup introduces the MultiSync 3DS, for all intents the vintage MultiSync 3D with emissions

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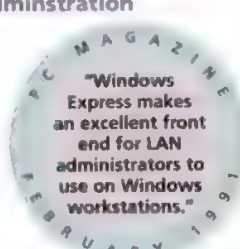
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MONITORS SUPER VGA MONITORS

lowered to meet Sweden's tough standards. The best news is that the MultiSync 3DS costs the same as the MultiSync 3D. Of the 22 Super VGA monitors reviewed in this article, three are marketed as low-emission units: the Hitachi/NSA 14MVX/LMF, the Iiyama Idek MF-5015A, and the NEC MultiSync 3DS. (For an in-depth look at the emission issue, see the sidebar "Monitor Emissions: Should You Worry?")

SLOT MASK VS. SHADOW MASK

Another trend in midrange monitors is more visible—new styles of picture tube. The slot-mask tube, usually referred to as a Sony Trinitron (trademarked by Sony Corp. of America, which invented the technology), is growing in popularity. Four of the monitors in this review use the Sony Trinitron tube: the Seiko CM1450, the Sony CPD-1304 Multiscan HG, the Taxan MultiVision 795, and the ViewSonic 5. Because Sony's original patents on Trinitron technology lapsed early this year (1991), other manufacturers may take on the challenge of building slot-mask tubes and monitors, but have not thus far.

The advent of Trinitrons won't drive down prices of conventional shadow-mask products, however. Trinitron tubes are inherently more difficult to build than shadow-mask tubes. The Trinitron uses an aperture grille (slots) instead of the dot-holed shadow mask used by conventional picture tubes. One electron gun (instead of the three in conventional tubes) shoots electrons at the screen, which is covered with vertical colored phosphor stripes instead of the color-dot triads found on other monitors. Because the slots allow more electrons to pass through to the screen than do the tiny holes of a shadow mask, a Trinitron can (in theory) create a brighter image. In addition, the single gun in the Trinitron means there is less to go wrong. The images it makes should be easier to control, and alignment problems should be minimal.

During PC Magazine Labs' testing, however, the Trinitron image proved mediocre in quality, with convergence problems on a par with more-conventional monitors. And when we adjusted its signals to equal levels, its brightness was no better than the shadow-masked tube of the NEC MultiSync 3DS.

Some monitor makers see merits in the Trinitron technology and are eyeing a



EDITORS' CHOICE

- MAG Colorview/15
- Sony CPD-1304 Multiscan HG

new 17-inch Trinitron that Sony is preparing, hoping to build new monitors around it later this year. But others say that users don't like the Trinitron tube for its most prominent image defect—a thin black horizontal line (two on larger tubes) that runs across the middle of the screen, caused by the tensioning wire that holds the aperture grille together. This thin line is most apparent across a white screen, the default of a program for which many people want Super VGA monitors: *Windows 3.0*.

Rather than use the Trinitron, some monitor makers are awaiting innovations in more-conventional tubes. Among these are shadow masks made from Invar (a metal alloy that expands minimally when heated). The new masks promise to boost image brightness by helping maintain focus at high beam intensities. Monitors with Invar shadow masks are likely to appear as soon as the 1991 Fall Comdex.

Another upcoming innovation is the flat square picture tube. Although neither truly flat nor square, these new tubes will have squarer corners and flatter faces that reflect less glare. Expect them to appear in force at Fall Comdex as well.

WHAT TO LOOK FOR

Besides low emissions and a slot mask, there are also a number of standard features anyone buying a display should consider. The 22 Super VGA monitors reviewed here all have some features in common: Each has FCC Class B status and comes with a tilt/swivel base and a mini DB-15 adapter cable.

When shopping for a small-screen Super VGA monitor, you'll want to look for several features that determine how compatible and useful each product will be.

The *scanning frequency range* is your first and most important consideration. It is usually expressed as two different figures. The vertical refresh rate, which is sometimes called the vertical scanning frequency, is expressed in Hz and determines how often the monitor completely updates the screen. The horizontal scanning frequency, measured in kHz, indicates the rate at which the monitor draws the image's individual scan lines.

These frequency ranges are important to you because they determine which video standards the monitor can work with. IBM's CGA requires a horizontal frequency of 15.75 kHz; MDA, 18 kHz; EGA, 22 kHz; and VGA, 31.5 kHz. At Super VGA resolution, horizontal scanning frequencies depend on the vertical

Right now, there are two important criteria to consider when buying a Super VGA monitor: a high vertical refresh rate and low magnetic field emission. At present, however, you can't get both in one package. Many people are worried about the way that VLF signals (emitted mainly from computer monitors and TVs) and ELF signals (emitted by all electrical devices) may affect their health, but since there has been no conclusive evidence so far, the VESA-recommended high vertical refresh rate and its undoubted effect on your personal comfort should be your primary concern.

VESA has defined three vertical refresh rates for the Super VGA standard: 56 Hz and 60 Hz (both called "manufacturers' guidelines"), and the official standard of 72 Hz. Since the 72-Hz standard was felt to be the most beneficial for your eyes during our testing, only the monitors that supported it among the ones reviewed here were eligible for Editors' Choice.

In this group, all produced passable images, but the \$1,099 MAG Colorview/15 was clearly the best. It received solid performance scores, and its image was one of the most pleasing to the naked eye. With its wide 100-MHz video bandwidth, the Colorview/15 fully supports the 72-Hz VESA standard and can display noninterlaced images with up to 1,024 by 768 pixels. Well designed, it has front-mounted digital controls and even an LED indicator to show what resolution it is in. Though its list price is high, its street price is around \$800; however, you may have trouble finding a dealer.

The next-best display belongs to the Trinitron-based Sony 1304 Multiscan HG. The 1304 lists at \$1,149, but because of Sony's ongoing price competition with NEC, it can be readily found for as low as \$630. With only two controls front

mounted and none digital, it doesn't quite match up to the MAG ergonomically, but at least it doesn't have any knobs in the rear. However, it did come close to the MAG Colorview/15 in display quality, showing a pleasing, flicker-free image at 800 by 600 pixels running at the VESA-recommended 72-Hz vertical refresh rate. It also wins because of its flexibility: The 1304 supports a long list of display card drivers and resolutions.

Three displays in the roundup—the Hitachi 14MVX/LMF, the Idek MF-5015A, and the NEC 3DS—represented the low-emission front. Even though the NEC 3DS is basically a low-emission twin of the NEC 3D, which won Editors' Choice in our May 15, 1990, roundup, none of these units warranted an Editors' Choice. The NEC 3DS isn't rated to support the 72-Hz standard or even the 60-Hz VESA guideline, and the quality of its display was flat out beaten by the MAG, the Sony, and the Hitachi units. The \$895 Hitachi 14MVX/LMF wins an honorable mention because of its image quality, recommended vertical refresh rate of 60 Hz in Super VGA resolution, and front-mounted controls.

Remember that *PC Magazine* recommends a 16- or 17-inch display for extended use of 800-by-600 resolution. This size, which gives you the most readable picture while still accommodating more information on-screen, generally costs only about \$200 to \$300 more than the smaller monitors. If the jump in price doesn't stop you, take a look at our two Editors' Choice winners for the 16-inch category (see "16-Inch Monitors: Sized for Super VGA," *PC Magazine*, March 26, 1991): the Idek MF-5117 and the NEC MultiSync 4D. Seriously consider the newly announced low-emission NEC MultiSync 4DS, which supports 72 Hz at 800 by 600.

MONITORS SUPER VGA MONITORS

refresh rate used. At a 56-Hz vertical refresh rate, 35 kHz is adequate, but at the official VESA standard of 72 Hz, you will need a 48-kHz rate.

The lowest frame rate normally required is the 50 Hz used by MDA signals. VGA and most other video standards use vertical refresh rates between 60 and 70 Hz. IBM's interlaced 8514/A requires that a monitor handle a vertical refresh rate of about 88 Hz. (For a convenient chart of

video standards, see "From MDA to XGA: A Guide to Video Standards," *PC Magazine*, February 26, 1991.)

In addition to determining a match between your monitor and your graphics adapter, the vertical refresh rate is important for ergonomics. Higher vertical refresh rates allow for a less visually stressful display. When buying both a monitor

and a graphics adapter, look for 70 Hz in VGA and 72 Hz in Super VGA.

Autosizing allows a monitor to maintain a consistent image size, no matter what video signal your display adapter is sending it. All else being equal, a Super VGA image with 600 lines will be 50 percent taller than a text-mode VGA signal with 400 lines. Without autosizing, the text image would fill but a narrow band in the middle of the screen while the Super VGA graphics might stretch past the top and bottom of the monitor's bezel.

Monitor makers can achieve autosizing in several ways. True autosizing works regardless of the signal going to the monitor and scales the image to match the number of display lines. Mode-sensitive autosizing works by determining the display mode used for an image from the frequency of the signal. It then switches the size to a preset standard to match the number of lines in the signal. Typically, digital controls allow you to independently tailor the image size for each mode the monitor can detect. VGA autosizing is limited to the three VGA modes with different line counts and works by detecting a coded pattern of synchronizing signals. Monitors often combine VGA with mode-sensitive autosizing.

Image quality is key when picking a monitor, although quality varies from unit to unit. We have described the image quality displayed by our test units in the reviews. The results are used to confirm findings made by the human eye.

The *phosphor type* describes the phosphor compounds that are coated inside the face of a monitor's picture tube. When struck by the tube's electron beams the phosphors glow and create the image.

Persistence is the most important characteristic of screen phosphors. It indicates how long the phosphors continue to glow after being struck by the picture tube's electron beams. Long-persistence phosphors minimize flicker in interlaced images. However, these phosphors exhibit lag—the screen blurring you encounter when you scroll—and therefore leave ghost images behind for several seconds every time the monitor completely updates the screen. Monitors with short- or medium-persistence phosphors quickly snap between images, but this may be unacceptable to your eyes for interlaced images such as those produced by IBM's 8514/A and XGA display systems.

TTL ability is necessary for any monitor that is meant to be used with a pre-

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VGA display adapter. The MDA, CGA, and EGA standards all use digital signals, which are sometimes called TTL because these signals are at the same level as the transistor-transistor logic family.

Color support is almost a moot issue with VGA and Super VGA monitors because their analog inputs accept a nearly infinite array of color—a much wider range than any display adapter can create. However, when a multiscanning monitor is used with older digital display standards, color support becomes an issue. To be compatible with the CGA standard, a monitor must be able to handle a 16-color digital input, sometimes called RGBI for the four (red, green, blue, and intensity) signals it is made from. EGA compatibility requires 64-color capability.

Anti-glare treatment reduces the reflections caused by your working environment from your monitor screen. These reflections can wash out the image and make it unreadable or interfere enough with screen legibility to increase eye strain and cause headaches. Typically, screens are coated with a silica compound or they are etched. While the treatment diffuses and dims the reflections, image contrast and sharpness also suffer. In general, however, most people prefer anti-glare treatment to shiny screens.

Size and position controls give you command of how much screen the image on your monitor fills. With full-range controls, you can expand the image to fill the screen from corner to corner or reduce it to a smaller size, thereby minimizing the inevitable geometric distortion that occurs near the edges of the tube. A full complement of controls includes one each of the following: horizontal position (sometimes termed phase), vertical position, horizontal size (sometimes called width), and vertical size (or height).

A wide control range is better than a narrow one. Some monitors skimp on one or more controls and limit how large you can make the on-screen image. Worse yet, sometimes a monitor maker won't include a control at all. For example, the NEC MultiSync 2A has no horizontal size control. As a result, you cannot adjust both the size and aspect ratio of the image.

The optimum position for these controls is on the front panel, where you can both adjust them and view the image at the same time. These image controls come in two types: analog and digital. *Analog controls* are like the familiar old knobs you find on vintage television sets. Twist the

control one way and the image gets bigger; twist it the other way and it shrinks. Analog controls have one virtue: Just by looking at the knob you know where they are set, whether at one or the other extreme of their travel. And the control itself is a simple memory system. It stays put until you move it again. But analog controls also become dirty and wear out with

age. They usually allow you to set but one value per knob—one value that must cover all of the monitor's operating modes.

Digital controls give you pushbutton control over image parameters. Press one button and the image gets larger or moves to the left. Another compensates in the opposite direction. Usually, digital controls are linked with a microprocessor, memory, and mode-sensing circuitry so that you can preset different image heights

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and widths for every video standard your monitor can display.

Digital controls don't get noisy with age and are more reliable. But you never know when you are approaching the limit of their travel. Most have two-speed operation: Hold them in momentarily and they make minute changes; keep holding the button and they shift gears to make gross changes. Of course, if you don't anticipate the shift, you will overshoot the desired setting and will spend a few extra moments zeroing in on the exact setting.

SELECTION CRITERIA

For this review, each monitor had to meet several objective criteria. Its diagonal screen size had to be between 13 and 15 inches. Monitors have to support standard VGA as well as Super VGA (800 by 600 noninterlaced at VESA's Super VGA standard of 72 Hz or its manufacturing guidelines of 56 or 60 Hz). They also had to be compatible with our standard test-bed, a Compaq Deskpro 386/25e equipped with ATI Technology's VGA Wonder Plus (a Super VGA adapter which can be programmed for 56-, 60-, or 70-Hz operation at 800-by-600 resolution). We tested all the monitors at the highest vertical refresh rate they could support.

We were unable to review all of the monitors on the market that meet these qualifications (we counted more than 50 that were eligible). These 22 best represent today's marketplace. Notable omissions are Packard Bell and Tandy Corp., both of which were readying products as we went to press.

MONITORS

SUPER VGA MONITORS

AST RESEARCH INC. AST Super VGA

by Alfred Poor

The AST Super VGA is typical of monitors in this class; it has a 13-inch-diagonal screen, supports 800-by-600 noninterlaced and 1,024-by-768 interlaced resolutions, and carries a \$695 price tag—about average for this group. But due to lackluster performance, a slow vertical refresh rate, and some design flaws, the monitor ends up with little to bring it to the top of the competitive heap.

The AST Super VGA's list price includes a tilt/swivel base, a power cord, documentation, and a permanently attached cable that ends in a 15-pin connector. The manual is thin, and the fact that it covers three different monitors in just 20 small pages makes it even more skimpy. There is not much in this book that you cannot figure out simply by looking at the monitor's case.

One of the display's most severe shortcomings is its inability to handle fast vertical scanning frequencies in 800-by-600 mode. Its screen is scrambled at a 72-Hz vertical refresh rate, and at 60 Hz the produced image is shrunken and off center. Only when you step down to 56 Hz do you get a proper-sized image. At this slow refresh rate, the flicker is somewhere between noticeable and downright annoying, especially when the screen is filled with a white background (like the one used by *Microsoft Windows 3.0*). An AST representative confirmed that you need to



The \$695 AST Super VGA is plagued by flicker in Super VGA mode and an outmoded design.

run this monitor at 56 Hz for 800-by-600 resolution.

The AST Super VGA did not distinguish itself on our performance tests either. The horizontal line widths were clearly thicker than the vertical lines, which is distracting at best. Images produced in 800-by-600 mode showed less stability than nearly every other monitor in the group. Only the vertical pincushioning measurements were solid compared with the rest of the competition. The monitor's convergence was fairly good, although the red beam was a bit low at the bottom corners and a bit high and to the right in the upper-right-hand corner. The image itself was clear if not entirely crisp.

The controls on the AST Super VGA are not as convenient as they might be. You can easily reach the large power switch and the two brightness and contrast roller controls, which are on the front of the case. The other three controls for horizontal and vertical position and vertical size are not only on the back of the case, but you will need a screwdriver or alignment tool to make adjustments; fine-tuning the image size is clearly a task for two people, or maybe one gorilla if its arms are long enough. The fact that there is no horizontal-image size control is another detracting factor.

The AST Super VGA monitor is old news. If you are going to run 800-by-600 modes, you may as well get a monitor that can handle the new vertical scanning frequencies of 72 Hz or higher. The AST Super VGA does not offer enough other incentives in terms of price, performance, or features to make it an attractive value in today's market.



FAST FILE

AST Super VGA

AST Research Inc., 16251 Alton Pkwy., P.O. Box 19658, Irvine, CA 92713-9658; 714-727-4141.

List Price: \$695 (tilt/swivel base and cable included).

Requires: VGA, Super VGA, or 8514/A-compatible graphics adapter.

Visible Diagonal Screen Size: 13 inches.

In Short: The AST Super VGA, limited to a 56-Hz vertical refresh rate for 800-by-600 resolution, has an outmoded design with few value-enhancing features. You would do better elsewhere.

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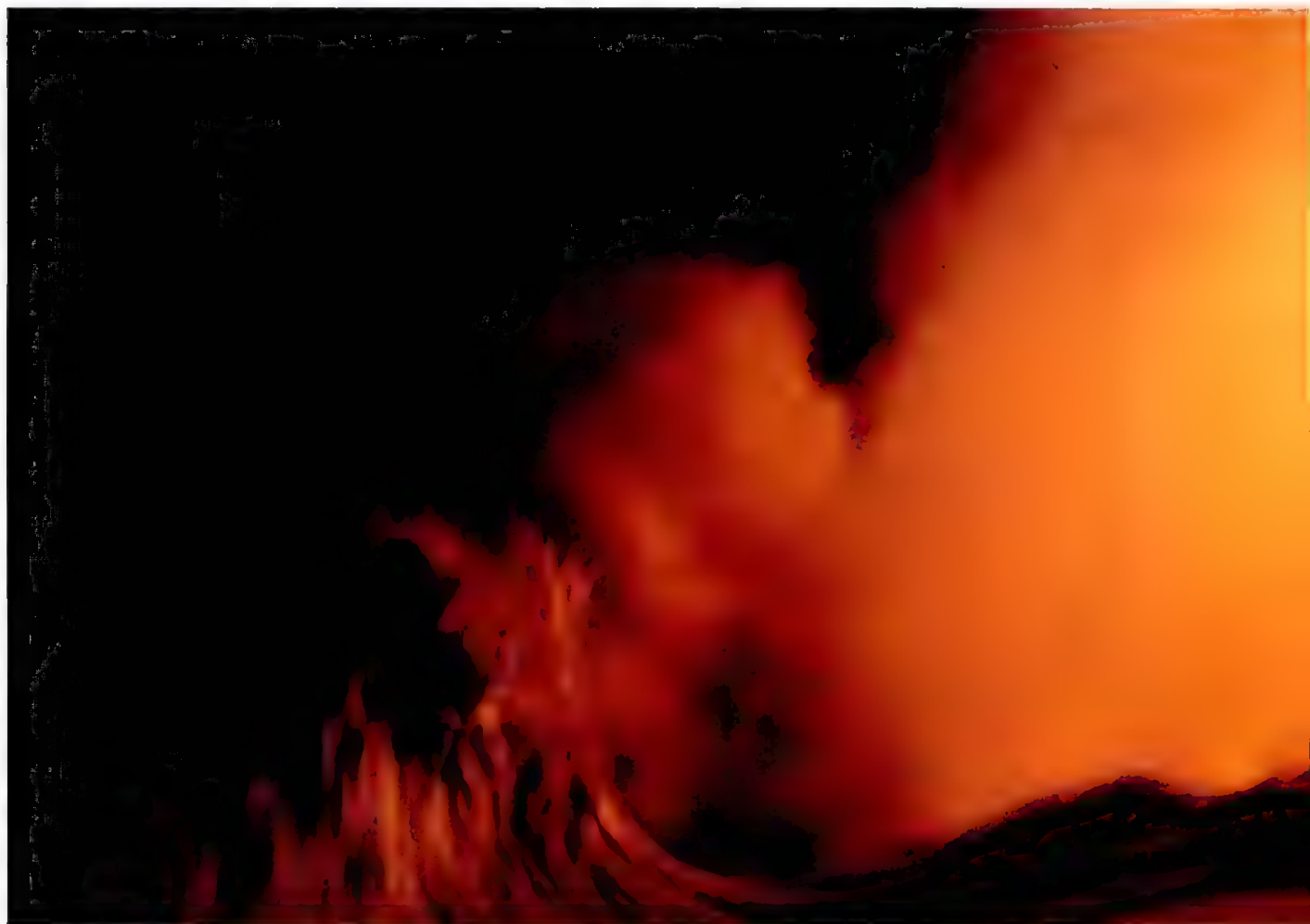
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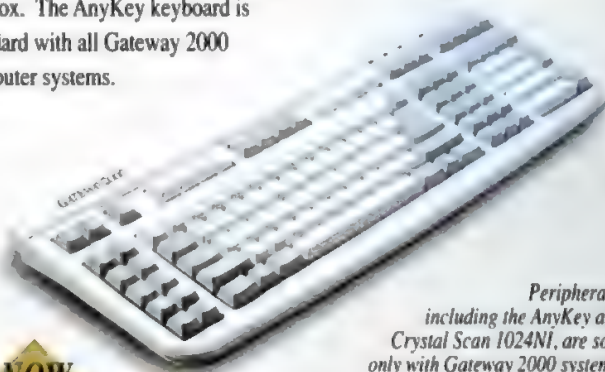
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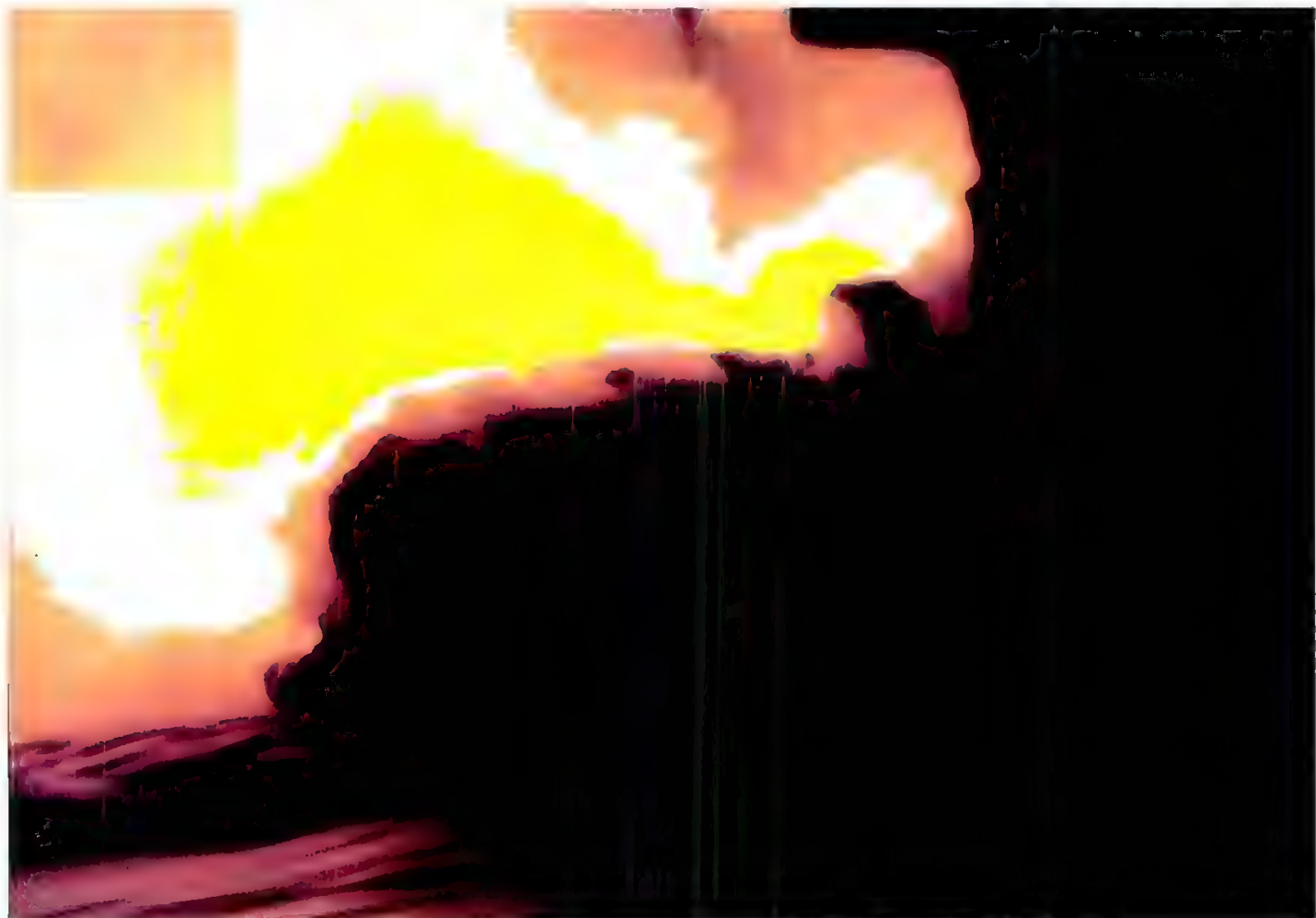
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CTX INTERNATIONAL INC. CTX 5468 Super VGA Monitor

by Alfred Poor

CTX International's entry into the high-resolution market is the 13-inch-diagonal CTX 5468 Super VGA Monitor. With its list price of \$565, it offers 800-by-600 noninterlaced resolution (though this mode requires a slow 56-Hz vertical refresh rate), a 1,024-by-768 interlaced mode, and a tilt/swivel base. To be a competitive monitor, however, the CTX 5468 requires more than this.

The CTX 5468's biggest limitation is its 800-by-600 mode—the main reason that most users would consider purchasing this unit in the first place. Higher vertical refresh rates are desirable because they help to reduce flicker, but this screen looks like bad tweed when fed a 72-Hz signal. Drop it down to 60 Hz and the image shrinks horizontally to about two-thirds of its normal size. Only when you slow the refresh rate down to 56 Hz do you get a full-size 800-by-600 image, but you also get irritating flicker—especially when the monitor displays the solid bright background that's favored by GUI applications.

The CTX 5468 we received showed some performance problems as well. While PC Magazine Labs' test equipment proved that the unit's horizontal and vertical lines had fairly consistent widths, the vertical lines were significantly dimmer and appeared to be much thinner. There was also a fair amount of image instability



The \$565 CTX 5468 Super VGA Monitor has too much flicker and not enough performance.

when viewed up close—an observation borne out by the time-variance test measurements. The CTX 5468 also had the worst horizontal pincushioning results of the field. It did do fairly well on the convergence test, and the 45-MHz bandwidth helped produce fairly sharp images on-screen.

The CTX 5468's controls are all located on the front of the case: brightness, contrast, horizontal and vertical position, power, and vertical size. There is no horizontal size control. Aside from the power button, the rest of the controls are thumbwheels and were easy to locate and adjust as needed. The monitor is a relative lightweight in its class, tipping the scales at just 26 pounds.

Our evaluation unit came with a thin but thorough manual, which included detailed timing charts for the video signals, a pinout diagram for the attached cable's 15-pin connector, and plenty of helpful illustrations. CTX has announced a version of this monitor, the 5468NI, that will list for \$665 and support a 1,024-by-768 noninterlaced mode. It is expected to ship by the summer of 1991.

For now, however, the CTX 5468 does not have much to offer compared with the competition. Its price is fairly attractive, especially when you consider the fact that you can purchase the monitor through mail-order sources for at least a 30 percent discount. Yet the point of this monitor is its 800-by-600 mode, and most users will want to get a tube that can handle higher vertical refresh rates in order to reduce flicker. There are simply better values available.

GOLDSTAR TECHNOLOGY INC. GoldStar 1460 Plus VGA

by Alfred Poor

PC Magazine reviewed the 1460 Plus VGA from GoldStar Technology in the May 15, 1990, issue (see "Super VGA: Monitors with More"). The product has maintained its \$799 list price and can still handle 800-by-600 noninterlaced and 1,024-by-768 interlaced signals, but the rest of the world has changed around it. A year ago this monitor presented a reasonable alternative; today the 1460 Plus VGA remains an also-ran.

One of the most important changes in our expectations concerns vertical scanning frequencies for high-resolution monitors. Unfortunately, the 1460 Plus VGA does a credible imitation of a haystack in a tornado if you send it an 800-by-600 signal with a 72-Hz or even a 60-Hz vertical scanning frequency. Only when you drop down to 56 Hz do you attain a stable image—and definitely obnoxious flicker.

STRIVING TO BE AVERAGE

The monitor's performance was otherwise average at best. Its line widths were fairly consistent in Super VGA resolution, though the 1460 Plus VGA had the worst line-width deviation in VGA resolution—nearly 50 percent. On the pincushioning and convergence tests, the unit's scores were average. The image itself was fairly crisp with generally good convergence.



FACT FILE

CTX 5468 Super VGA Monitor

CTX International Inc., 20530 Earlgate St., Walnut, CA 91789; 714-595-6146.

List Price: \$565 (tilt/swivel base and cable included).

Requires: MCGA, VGA, Super VGA, or 8514/A-compatible graphics adapter.

Visible Diagonal Screen Size: 13 inches.

In Short: Hampered by its inability to display 800-by-600 images at vertical refresh rates above 56 Hz, the CTX 5468 has too much screen flicker and not enough performance to make it an attractive prospect.

CIRCLE 610 ON READER SERVICE CARD



FACT FILE

GoldStar 1460 Plus VGA

GoldStar Technology Inc., 3003 N. 1st St., San Jose, CA 95134-2004; 408-432-1331.

List Price: \$799 (tilt/swivel base and cable included).

Requires: VGA, Super VGA, or 8514/A-compatible graphics adapter.

Visible Diagonal Screen Size: 13 inches.

In Short: The GoldStar 1460 Plus VGA cannot handle high vertical refresh rates for its 800-by-600 display mode—a serious handicap. While its list price is often heavily discounted, its technical limitations make this monitor an unattractive bargain.

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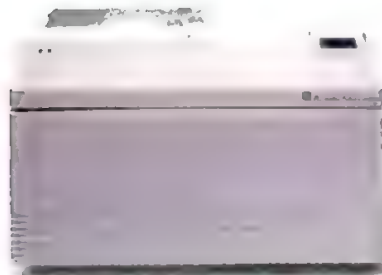
Resolution enhancement

The LaserJet III printer has a resolution enhancement technology that provides 300 dpi print quality superior to that of ordinary laser printers.

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The \$799 GoldStar 1460 Plus VGA was an average performer, but it also suffered from noticeable flicker.

The 1460 Plus VGA comes with a tilt/swivel base and has a captive adapter cable that ends in a standard 15-pin connector. The only controls situated on the front of the case are a power button and two sliders for contrast and brightness (the latter are difficult to adjust with any precision). Four controls for horizontal and vertical size and position are located

SUPER VGA MONITORS

in the back. Even though it may be a little awkward to reach these controls while viewing the screen, at least the 1460 Plus VGA includes the important horizontal size adjustment control that many other monitors lack.

The user manual accompanying the monitor is thin and of uneven quality. Some of the material is dated, and other parts are hard to locate in a hurry. It will offer little help to the uninitiated, but knowledgeable users can find some useful information. GoldStar Technology offers a one-year parts-and-labor warranty but guarantees the picture tube for three years.

It is worth noting that the 1460 Plus VGA is heavily discounted in mail-order channels by 50 percent or more, making its street price extremely competitive. Unfortunately, it still takes more than a low price to make a truly attractive value, and if you intend to run 800-by-600 mode, you will do better to hold out for a monitor with a faster vertical refresh rate.

HITACHI/NISSEI SANGYO
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Hitachi/NSA 14MVX/LMF

by Joe Desposito

Hitachi, a name you are more likely to associate with high-end monitors, has produced an \$895 14-inch multiscanning monitor. Marketed by a Hitachi subsidiary, Nissei Sangyo America, the Hitachi/NSA 14MVX/LMF supports a rated 60-Hz vertical refresh rate in 800-by-600 mode and, as its LMF initials indicate, offers low magnetic-field emissions.

The controls for the 14MVX/LMF are on a recessed panel, engraved with six easily understandable icons, underneath the monitor's front. With these controls, you can adjust the horizontal and vertical size and position as well as contrast and brightness. With the horizontal size control, you can expand the image to the full width of the display—a feat not many monitors can match. Likewise, the vertical size control lets you expand the image

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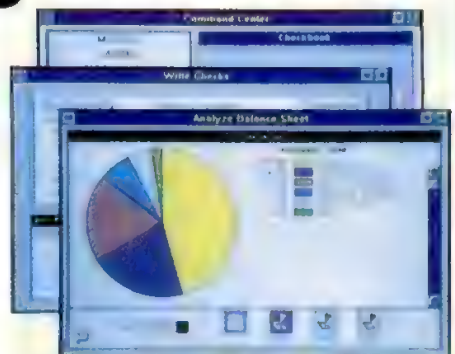
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— MacUser April, 1991

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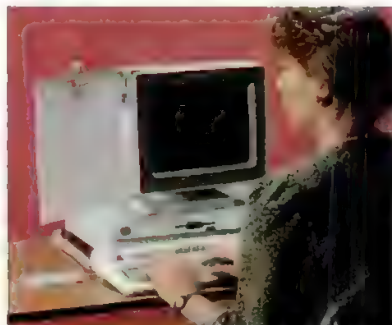
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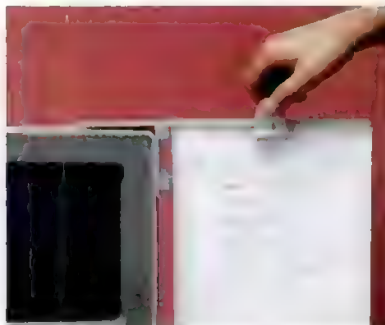
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STANDARDIZING SUPER VGA: The Role of VESA

by Winn L. Rosch

When Super VGA screens first appeared in 1988, switching to 800-by-600 mode usually meant that you often twiddled a handful of knobs to recenter an on-screen image. The problem was that every Super VGA graphics adapter manufacturer used its own arbitrary video-signal timing. Different timings mean different positions for a monitor's on-screen image.



THE EARLY YEARS: PROPRIETARY TIMINGS

Adapter makers could use proprietary timings with impunity because there were no standards. And since the skewed image appeared on the monitor, consumers naturally blamed their monitors, not their graphics adapters.

As you might imagine, monitor makers were not delighted by this situation, and one of them decided to do something about it. In 1988, NEC Technologies, maker of the MultiSync monitor line that gave promise to Super VGA (and suffered the indignities of its timing problems), banded together the most-prominent Super VGA graphics adapter manufacturers and monitor makers to create the Video Electronics Standards Association (VESA). Within the first three years of its existence, VESA came to embrace every maker of display adapters, most monitor manufacturers, and even large computer companies like IBM and Compaq.

SUPER VGA: TEST OF FIRE

The first challenge facing the fledgling organization was to right the disheveled Super VGA situation. The problem was more than just timing, however. Every manufacturer of display adapters created its own Super VGA display mode so the board could link with software. For 800-by-600 mode, each Super VGA display adapter had its own BIOS and name (mode number). And for each board, manufacturers had to write individual software drivers. Super VGA did you no good without

appropriate drivers, and few software publishers were willing to write separate drivers for a dozen different boards.

VESA conquered this problem by creating a "phantom" mode—number 6A—that would be universally recognized as Super VGA. Even though each graphics card has its own Super VGA engine on-board, mode 6A is the universal ignition key that starts any of these engines. Calling this mode automatically triggers every conforming Super VGA adapter's 800-by-600 mode. Although drivers are not yet universal, they may be eventually, since implementation requires only minor changes to the card's video BIOS—no great headache to board makers.

The original signal-timing problem proved less tractable because VESA members had two conflicting goals. The adapter makers desired a high refresh rate because it would minimize image flicker. Monitor manufacturers rallied for a standard that more suited their stocks of existing multiscanning monitors—one with a lower refresh rate. The result was VESA's great compromise. It adopted not one standard, but three: an official hardware standard and two manufacturing guidelines.

The official standard places the vertical refresh rate for 800-by-600 at 72 Hz. This high rate ensures the elimination of flicker, a degree of compatibility with whatever European standard may arise, and compatibility with 1,024-by-768 displays that use a 60-Hz vertical

refresh rate. (Both 800-by-600 at 72 Hz and 1,024-by-768 at 60 Hz operate with a 48-kHz horizontal scanning frequency.)

For compatibility with older monitors, VESA has set its two manufacturing guidelines at 56- and 60-Hz for vertical refresh rates at 800-by-600 resolution. The first is compatible with older dual-frequency monitors and limited-bandwidth multiscanning displays designed for the 8514/A 35.5-kHz horizontal scanning frequency.

(As NEC's MultiSync 2A and MultiSync 3D units fit this class, try to guess which company lobbied hardest for this!) The 60-Hz guideline is a compromise that allows for less-expensive electronics (than 72-Hz monitors) and a reasonable refresh rate (better than 56 Hz).

These guidelines are not superfluous, and they serve a valuable purpose. By defining the exact timing of all the video signal's characteristics, the images produced by a display adapter that follows the VESA guidelines will appear at the same place on the screen—no more moving margins.

BREAKING NEW GROUND

With the standardization of Super VGA behind it, VESA has moved into other territories. It is developing a hardware standard for 8514/A display adapters to fill IBM's glaring omission of documentation. And VESA is debating XGA, IBM's new high-end graphics resolution spec, as a new standard—a practice promoted primarily by IBM.

In fact, VESA has become a video-debating society. And that isn't bad. Its various committees provide a way for various video engineers to exchange valuable ideas and information. Through the cooperation wrought by VESA, the industry makes it possible for you to shift your primary concern from compatibility issues to quality and features. In the future, you should get an even wider choice of better-quality video products. ■

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The low-emission \$895 Hitachi/NSA 14MVX/LMF we reviewed produced good images, but it had a technical difficulty with brightness.

to the full height of the display, but this is more common. Included in the price of the monitor are a sleekly designed tilt/swivel base, a built-in 72-inch adapter cable with a 15-pin mini-DB connector, and a power cord.

If you are concerned about magnetic or electrostatic fields produced by monitors, the 14MVX/LMF can assuage your fears.

MONITORS SUPER VGA MONITORS

It complies with the stringent Swedish regulations for monitors, which means the monitor emits only an extremely low magnetic field when emissions are measured from the screen.

Overall, the on-screen images produced on the 14MVX/LMF's screen, which has a 0.28-millimeter dot pitch, were very good, and the tests reflected this. The monitor scored well in all categories and had the lowest swim ratio. However, to produce an image with bright and true colors, we had to turn up the contrast and brightness almost all the way. According to Nissei Sangyo America, a service depot can sometimes correct this problem by making internal adjustments.

Another interesting feature of the 14MVX/LMF is its ability to synchronize on a 120-Hz vertical scanning frequency. This means the monitor can be used with graphics adapters that offer "stereo" graphics, which produce a three-dimensional image (if you have 3-D glasses).

The Hitachi 14MVX/LMF comes with a two-year warranty on parts and labor. If there is a problem, you send the monitor

back to the dealer or a Hitachi service depot and the company swaps your unit for a new one.

Nissei Sangyo America has an impressive entry in the 14-inch monitor market. All is not perfect; you will notice some problems on the outer edges of the screen when you run *Microsoft Windows 3.0* in 800-by-600 mode, and it doesn't support Super VGA at 72 Hz. But the 14MVX/LMF otherwise delivers a fine image and other extras, such as accessible controls,

FACT FILE

Hitachi/NSA 14MVX/LMF

Hitachi/Nissei Sangyo America Ltd., 800 South St., Waltham, MA 02154; 800-441-4832, 617-893-5700.

List Price: \$895.

Requires: Mac II, VGA, Super VGA, or 8514/A-compatible graphics adapter.

Visible Diagonal Screen Size: 13 inches.

In Short: The 14MVX/LMF's rated 60-Hz vertical refresh rate at 800-by-600 is counterbalanced by accessible controls, low radiation emissions, and solid performance.

CIRCLE 612 ON READER SERVICE CARD

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PSS-P6	6	Parallel	\$229
PSS-S4	4	Serial	\$199
PSS-S6	6	Serial	\$229

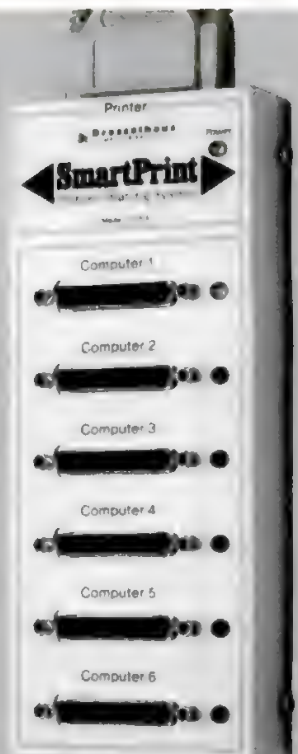
MULTI PRINTER SWITCH

Model	Computers	Printers	Price
MPS	1Par/1Ser	4Par/1Ser	\$249



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Intel 386™

Intel 386SX™

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To learn more about how IBM services can help you meet both your needs and your budget, call us at 1 800 IBM-6676, ext. 881.



low radiation, and an extended vertical frequency range. You may find it difficult to find a better monitor at this price.

HYUNDAI ELECTRONICS AMERICA

Hyundai HCM-421E

by Henry Fersko-Weiss

The HCM-421E, Hyundai's only Super VGA model, is the top of the company's product line. It is a standard 13-inch monitor with a sharp, clear image and an acceptable signal-compatibility range. With a list price of \$629, the HCM-421E's distinguishing features are an 18-month warranty and good service—for a little more money.

The HCM-421E will accept resolutions up to 1,024-by-768 interlaced. In 800-by-600, it runs optimally at only a 60-Hz vertical refresh rate. When it operates at 72 Hz, you can barely make out an image underneath the shimmering columns of lines; at 56 Hz, its images are as clear as at 60 Hz, but the screen flicker is noticeable and disturbing. Pincushioning is also more pronounced at 56 Hz.

At its optimal vertical scanning frequency, the HCM-421E's screen images are clear with little visible convergence problems. In Super VGA mode the image bowed dramatically at the top and bottom of the screen, but this problem was not as noticeable at the screen sides. In VGA mode there was almost no visible bowing.

In either mode the colors are strong, and white backgrounds are not muddled between tight lettering, although the letters lose a certain amount of clarity. Under



The \$629 Hyundai HCM-421E exhibited clear images in Super VGA mode. Unfortunately, its performance was marred by bowing problems.

some Microsoft Windows 3.0 applications, the image size changes, becoming elongated vertically so letters or objects are stretched out a bit. Also, the top of the menu bar gets cut off. This may happen because the software is written for a slightly different VGA mode than the ones that have been factory-programmed into the monitor. You can adjust the image size with the vertical size control at the back of the monitor, but this inconvenient location makes it difficult for you to see what you're doing.

Besides the control for vertical size, the HCM-421E has a minimal number of controls. The power, brightness, and contrast controls are easily within reach on the monitor's right side, just behind the frame of the CRT. The back also sports two knobs for horizontal position—one works in VGA mode and the other in Super VGA mode. The HCM-421E lacks alternate input connectors and has no output connectors. The VGA cable that comes with the unit is attached to the monitor and has a 15-pin D-sub connector on the other end; there are no substitutions for the cable. The unit does come with a base that is wide-rotating and also easy to tilt.

Hyundai's warranty is longer than usual for a monitor. You get 18 months of free parts and labor. The normal service arrangements require that you return the monitor to your dealer for repair. However, for a nominal fee of \$50 you get on-site service through Hyundai for the full 18 months; for \$75 more you can extend that on-site service another year. Hyun-

dai's toll-free technical support line is available Monday through Friday from 8:00 to 5:00 P.S.T. With the on-site service, you are guaranteed a 24-hour response time (the next business day). If the monitor can't be fixed in the field, you will receive a loaner until your unit is repaired or replaced so you'll have minimal down time.

While the HCM-421E is not highly featured, it offers good image quality at a reasonable price. Since the monitor is sold only through dealers, its street price should be less than the list of \$629. And if you opt for the on-site service, you are assured of steady performance for 18 months or more. This is something to consider, especially if you are buying in quantity for applications that are not too demanding.

Iiyama North America Inc.

Iiyama Idek MF-5015A

by Henry Fersko-Weiss

Iiyama's Idek MF-5015A uses a 15-inch flat tube and provides crisp images and vibrant colors. The monitor is one of the more feature-laden units we encountered and also boasts low radiation emission levels, analog and digital input (both cables are included), and a maximum resolution of 1,024-by-768 interlaced.

While the list price of \$995 is at the higher end of the range for these small-screen Super VGA monitors, aggressive discounting through dealers brings the street price down to the \$700 area. Last fall, the company changed its U.S. distribution strategy. In the past, Idek monitors had been distributed by Pixelink Corp. and Agora. Since October of last year, however, Iiyama North America has been actively marketing the product line. The Japanese parent company has been in business for over 18 years, and the monitor quality reflects the company's longevity.

Earlier this year, the 17-inch 1,024-by-768 noninterlaced MF-5117 earned an Editors' Choice award (see "16-Inch Monitors: Sized for Super VGA," *PC Magazine*, March 26, 1991). It uses the same Toshiba flat-screen technology as the MF-5015A. However, the MF-5015A has most of the user controls on its back and so loses ergonomically to its award-winning sister monitor.



Hyundai HCM-421E

Hyundai Electronics America, 166 Baypointe Pkwy., San Jose, CA 95134; 800-727-6972, 408-473-9200.

List Price: \$629 (tilt/swivel base and cable included).

Requires: MCGA, VGA, Super VGA, or 8514/A-compatible graphics adapter.

Visible Diagonal Screen Size: 13 inches.

In Short: The Hyundai HCM-421E is a solid if standard monitor that runs optimally at a 60-Hz vertical refresh rate in 800-by-600 mode. If you are planning to buy a large quantity of monitors, the HCM-421E's service, support, and price make it worth your consideration.

CIRCLE 613 ON READER SERVICE CARD

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CIRCLE 157 ON READER SERVICE CARD

MONITORS
SUPER VGA MONITORS



The low-emission \$995 Iiyama Idek MF-5015A exhibited crisp images bothered only by slight pincushioning problems.

The company makes a number of other 17-inch to 21-inch monitors. In fact, the MF-5015A is the smallest monitor in the family, and it is the one with the narrowest scanning frequency range. It can go from CGA to 1,024-by-768 interlaced and is compatible with the Macintosh II (the adapter cable costs \$30). Its optimal vertical scanning frequency is only 60 Hz, although we were able to get an accept-

able image at 70 Hz. For the same price, Iiyama manufactures a version of the MF-5015A that uses long-persistence phosphors. That model is appropriate for multimedia applications, for which the most important feature is minimized screen flicker.

Images produced by the MF-5015A are bright and extremely sharp. Even under magnification there is very little color bleeding at the edges of lines or characters, indicating good convergence. Although it uses a 0.31-millimeter dot pitch, the monitor also has a very low ratio for horizontal-to-vertical line width, resulting in good pixel sizing. On PC Magazine Labs' tests, the results showed a fair amount of vertical pincushioning at a 60-Hz vertical scanning frequency, but it was hardly visible to the naked eye. However, when running the monitor at 56 Hz, this vertical bowing was visible and created a bumpy screen edge.

In the front of the unit you will find the brightness, contrast, power, and text-color controls. By pushing the three color buttons in different combinations, you can



FACT FILE

Iiyama Idek MF-5015A

Iiyama North America Inc., 650 Louis Dr., #120, Warminster, PA 18974; 215-957-6543.
List Price: \$995 (tilt/swivel base and cables included).

Requires: Mac II, CGA, EGA, MCGA, VGA, Super VGA, or 8514/A-compatible graphics adapter

Visible Diagonal Screen Size: 14 inches.

In Short: Iiyama's Idek MF-5015A can accept both analog and digital signals and handles 800-by-600 resolution at a 72-Hz vertical refresh rate. Also, its radiation emission level is notably low. Although the list price for the MF-5015A is at the high end, you can find it for much less on the street.

CIRCLE 614 ON READER SERVICE CARD

generate seven colors. On the back of the monitor, you will find the analog and digital input connectors and knobs for adjusting the horizontal and vertical size and position. These knobs are a little awkward to get to and represent a deviation from Iiyama's design, since these same controls are up front on its larger monitors.

While the MF-5015A's \$995 tag is a bit

We'd like to expand advantages of the



**The MF-5015A's
strong points include
low radiation
emission levels and
good picture quality.**

on the pricey side, it has a slightly larger screen and flat-tube technology. Plus, the company has treated the inside of the monitor's case so it will better shield the user from radiation. In addition to having FCC Class B certification, the MF-5015A has passed the stricter TUV emission standard in Europe. Strong points include low emission levels, its good picture quality, and its ability to accept both analog and digital signals. The monitor could be improved being optimized for 72 Hz at Super VGA. Controls that were better placed would help, too.

**MAG COMPUTRONIC (USA) INC.
MAG Colorview/15**

by Winn L. Rosch

The electronics of the 14-inch \$1,099 MAG Colorview/15 display will handle signals for all but the highest-resolution graphics adapters—up to 1,280 by 1,024 pixels, although the screen's 0.28-millimeter dot pitch can resolve a noninterlaced image no sharper than 1,024 by 768 pixels. Even so, the Colorview/15 is unmistakably sharp and well behaved—certainly rating at the top of the pack.

Its wide 100-MHz bandwidth and broad range of signal acceptance allows the Colorview/15 to accommodate vertical scanning frequencies from 50 to 120 Hz and horizontal scanning frequencies from 30 to 68 kHz. On PC Magazine Labs' tests, the Colorview/15 consistently scored in the middle of the test range, and its horizontal pincushioning score was excellent.

The electronics of the Colorview/15 are its finest virtue, and not just for their



The \$1,099 MAG Colorview/15, which displayed well-behaved images, turned in consistently average scores on PC Magazine Labs' tests.

range. They also automatically size the image in any of nine preset and eight user-defined modes. In actual operation, the Colorview/15 handles the autosizing chore with aplomb. Switch to a new mode and in a fraction of a second the image snaps to the new size—no glitches, no overshoot.

Of course, all these sophisticated electronics make the Colorview/15 a monitor

on one of the major ultimate DOS.



MONITORS
SUPER VGA MONITORS

**The Colorview/15
offers good
performance, a wide
bandwidth, and well-
placed controls.**

for those who don't want to look back. It makes no provision for digital signals or lower frequencies, so CGA, EGA, and similar primeval standards are off limits (unless your graphics adapter will do an emulation). On the other hand, a \$49 adapter will link the Colorview/15 to a Mac II, and optional BNC adapters will put it under the control of high-powered graphics controllers. Its standard-equipment video signal cable is nondetachable, measures 46-inches long, and ends in a standard 15-pin high-density VGA connector.

The Colorview/15, which has an extremely plain case, might have been the model for designing an icon. The screen itself is nearly flat, etched to ward off glare, and dark gray when switched off. Although not unduly odd-shaped, measuring 12 by 14 by 16 inches (HWD), the Colorview/15 appears elongated. Snapping the removable tilt/swivel base underneath adds 2 inches to the height but nothing to the cost. The press-open/press-closed door that hides the image controls is the only cheap part of the Colorview/15 case. It has an imperfect fit that makes you think the door will fall off at any minute.

Controls for size and image positioning are all digital pushbuttons hidden behind the underscreen door. These controls operate smoothly with two-speed operation, automatically switching from fine to gross adjustments after you hold the button down for about a second. Their range proved wide enough to stretch the image far beyond the bounds of the screen or shrink it to a half-size center-screen rectangle. Brightness and contrast controls are to the left of the control door, the

power pushbutton to the right.

A number of indicators, visible through windows in the control door, let you monitor the monitor. A single-digit numerical display shows the Colorview/15's current video mode. Individual LEDs show the kind of signal sync detected, whether the input signal is beyond the range of the monitor, and whether the



MAG Colorview/15
MAG Computronic (USA) Inc., 4392 Corporate Center Dr., Los Alamitos, CA 90720; 714-827-3998.

List Price: \$1,099.

Requires: Mac II, MCGA, VGA, Super VGA, 8514/A-compatible, or 1,024-by-768 noninterlaced graphics adapter.

Visible Diagonal Screen Size: 14 inches.

In Short: The Colorview/15 delivered solid performance on our tests. With its wide 100-MHz bandwidth and 72-Hz refresh compatibility in 800-by-600 mode, the Colorview/15 is an excellent monitor for those who don't need compatibility with old digital standards.

CIRCLE #16 ON READER SERVICE CARD



Colorview/15 is operating in user rather than preset mode.

The Colorview/15 has one additional feature: a universal power supply. Lug it anywhere in the world and you can still plug it in. The set is FCC Class B certified for most input signals and is covered by a one-year return-to-dealer warranty. The picture tube has a three-year warranty.

The Colorview/15 offers good performance, a wide bandwidth, support for 72 Hz at Super VGA, and well-placed controls. And with a street price of approximately \$800, the Colorview/15 offers an excellent value.

**MITSUBISHI ELECTRONICS
AMERICA INC.**

Mitsubishi Diamond Scan 14

by Henry Fersko-Weiss

Versatility is the most outstanding feature of the Mitsubishi Diamond Scan 14. It supports graphics standards from MDA right through 1,024-by-768 interlaced



The \$889 Mitsubishi Diamond Scan 14 produced a generally clear picture, but the monitor had a visible convergence problem.

mode and is also compatible with the Macintosh II and Apple II GS. In addition, it has separate input connectors for analog, TTL, and NTSC inputs, making it a good choice for multimedia applications. However, the screen showed some slight problems with convergence, such as

bowing at the edges, and swim.

The Diamond Scan 14 is one of the smaller monitors in Mitsubishi Electronics America's product line. The company, which has been selling monitors in the U.S. for 11 years, offers over 100 monitors, ranging in size from 12 to 37 inches, in both the distributor and OEM channels. There are four 14-inch models in addition to the Diamond Scan 14, including a long-persistence-phosphor version and a fixed-frequency VGA monitor. The \$889 Diamond Scan 14 is the workhorse of the group. It has a wide vertical scanning range of 45 to 90 Hz, though its optimal Super VGA scanning frequency is 60 Hz. At 72 Hz, the on-screen image becomes a mass of vibrating twisted lines.

In general, letters and images on the screen appear clear, colors have a good intensity, and the background does not get muddy even when the screen is filled with letters. The monitor has a 0.31-millimeter dot pitch and medium-short phosphor persistence. However, because of a slight problem with convergence, the naked eye can easily see color bleeding. When the screen is magnified, you can see that letters in the middle of the screen have a blue



MONITORS SUPER VGA MONITORS

The Diamond Scan 14 has an impressive set of controls, including knobs for color with NTSC signals.

glow. This problem showed up on PC Magazine Labs' tests; the product finished in the middle or near the bottom of the group on most tests. Its pincushioning scores were inferior in both VGA and Super VGA resolutions, and its line-width variations were nothing to rave about.

The Diamond Scan 14 has an impressive set of controls. The brightness, contrast, and power are located on the front; in the back are knobs for adjusting horizontal and vertical position and size. Plus, there are knobs to control color intensity and tint when receiving NTSC signals,

and the Diamond Scan 14 also has switches for the input signal, the TTL color, and the scan mode (allowing you to overscan for video). Another switch lets you control the monitor's vertical scanning when you connect an IBM PS/2 (VGA or MCGA).

In addition to all the controls on the back are a D-shell 25-pin connector and connectors for TTL and video signals. The 25-pin connector lets you use this monitor to superimpose text and graphics on live video images (if you have the appropriate equipment). The monitor comes with both analog and TTL cables at no extra charge, and a Macintosh II cable is available for \$35.

Mitsubishi offers the standard 12-month warranty on parts and labor. For repair, you can return your monitor to the manufacturer or to a dealer. Mitsubishi has three technicians dedicated to monitor support and five others who can fill in if needed. The technical support line is open from 8:30 to 4:30 P.S.T. You can also purchase on-site service through TRW.

For versatility, it is hard to top the Diamond Scan 14. It will accept analog,



FACT FILE

Mitsubishi Diamond Scan 14

Mitsubishi Electronics America Inc., Information Systems Div., 991 Knox St., Torrance, CA 90502; 800-843-2515, 213-217-5732.

List Price: \$889 (tilt/swivel base and cables included).

Requires: Apple II GS, Mac II, Hercules, MDA, CGA, EGA, MCGA, VGA, Super VGA, or 8514/A-compatible graphics adapter.

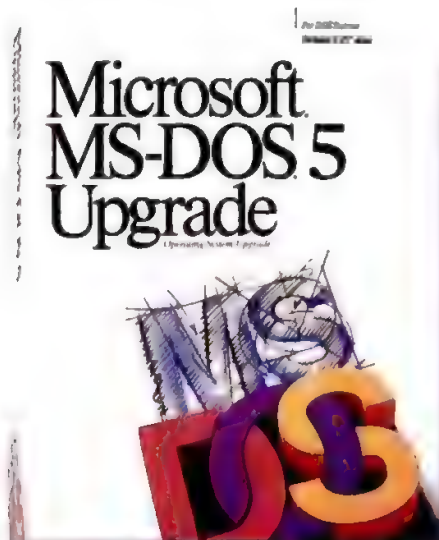
Visible Diagonal Screen Size: 13 inches.

In Short: The versatile Diamond Scan 14 can accept analog, TTL, and NTSC signals and is therefore a good choice for multimedia applications. But due to slight convergence, bowing, and swim problems as well as a low 60-Hz vertical refresh rate for 800-by-600 mode, the Diamond Scan 14 is less than ideal for demanding graphics work.

CIRCLE 616 ON READER SERVICE CARD

NTSC, monochrome, and TTL signals, making it a good choice for multimedia work. However, while the image quality is generally good, there are some problems with convergence and bowing. So if the graphics work you do is very demanding, this monitor may not be ideal.

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Installs quickly and easily across different PC hardware, even from a network.

NEC TECHNOLOGIES INC.
NEC MultiSync 2A

by Winn L. Rosch

If you want to advance to Super VGA, the MultiSync 2A from NEC Technologies is a minimal monitor but a quality product. Rather than multiscanning, it locks only onto a few fixed frequencies, and its resolution tops at 800 by 600 pixels. But if you do not want to go further or cannot spend more than its \$799 list price (about \$500 street price), the MultiSync 2A can be a satisfactory choice.

The MultiSync 2A is also minimal when compared to the rest of NEC Technologies' product line, where it is lodged at the bottom. It has one of the smallest screens—a 14-inch tube masked down so that only 13 inches are viewable—and the smallest acceptance range for video signals. The MultiSync 2A accepts only analog input signals, so it cannot reach back to display CGA or EGA images. Nor does the MultiSync 2A make any provision for monochrome. This monitor doesn't even feature a text-mode or text-color switch.



Although the \$799 NEC MultiSync 2A turned in widely erratic test results, its images balanced out.

In fitting with its minimal design, the MultiSync 2A features a modest selection of controls. The de rigueur brightness, contrast, and power thumbwheels are located under the screen's right front corner. Thumbwheels for vertical size and position and horizontal position are situated on the left; no horizontal size control

is available. While this omission means that you cannot adjust both the image size and aspect ratio of what you see, the factory-set width is pleasing and consistent across the MultiSync 2A's display modes.

The generally square MultiSync 2A case has a distinctively rounded back. It measures about 14 inches high and wide on its standard-equipment nonremovable tilt/swivel base, and the curve of its rear panel extends 16 inches back. The 66-inch nonremovable signal cable, which ends in a standard VGA connection (a 15-pin high-density male D-shell), and removable power cable are recessed under the back of the MultiSync 2A, giving the set a clean look even when your eyes are not on the screen.

The MultiSync 2A follows the VGA standard explicitly and will automatically adjust the height of its image for all its modes. For a second or so after the switch, the image appears unstable, overshooting then undershooting, but it quickly settles down.

Despite the MultiSync in its name, the MultiSync 2A locks only to horizontal scanning frequencies of 31.5 or 35 kHz

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The numbers given are specific to a particular 386 system. These numbers may vary on different hardware and software configurations.

Microsoft
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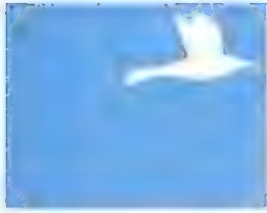
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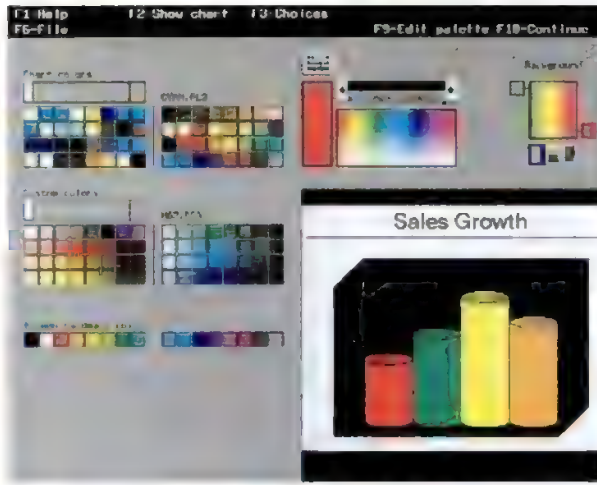
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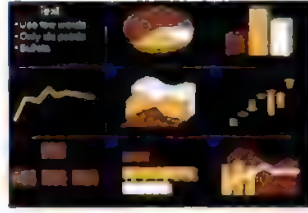
before their very eyes.



With business animation.



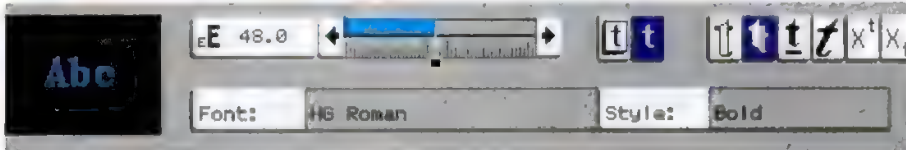
Choose from 32 color palettes. Then shade. And mix. And blend.



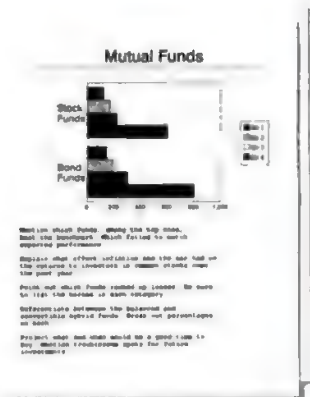
160 charts ready-to-go.



Fill it with bitmaps.



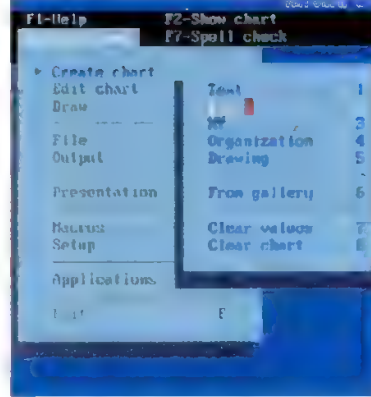
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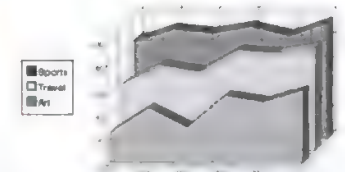


Twist it. Turn it.



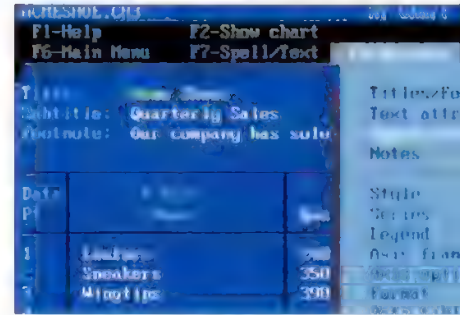
Look familiar? It should. It's Harvard Graphics.

Coffee Table Books Semi-Annual Sales



Source: Picture Book Magazine, Fall issue

What you see is what you get.



Pull-down menus: A new feature to get at the

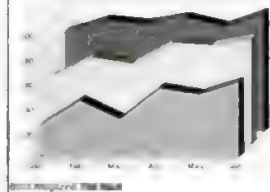


You enter the data, we'll make it look good. It's

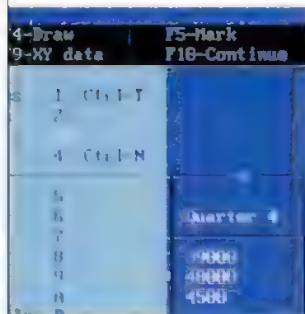
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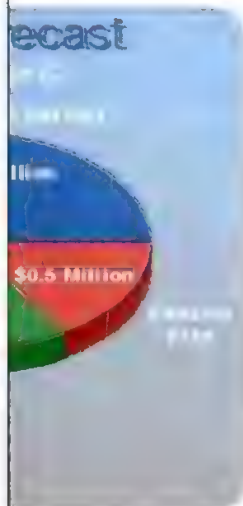
Coffee Table Books Semi-Annual Sales



Yes, we have WYSIWYG.



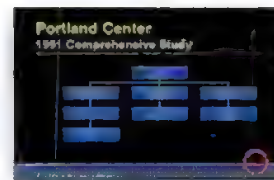
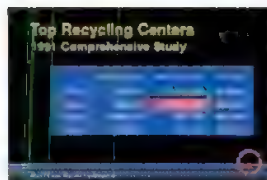
features. Easier than ever.



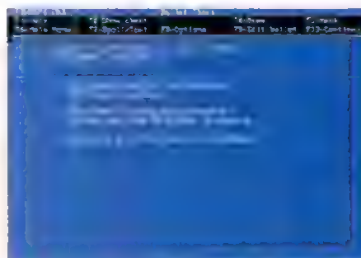
what you've known us for all along



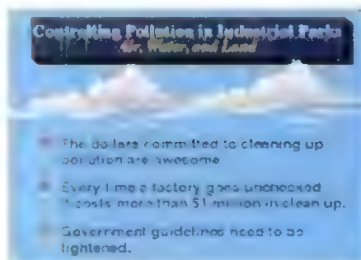
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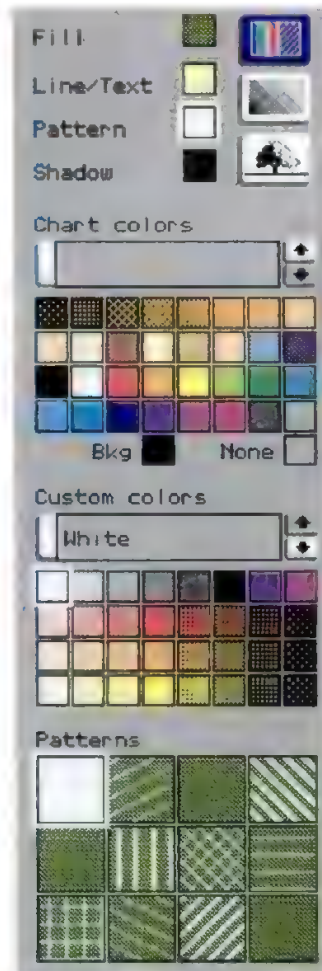
View Lotus Worksheet

F1-Help F4-Import from F5-Unmark
F9-Jump to F10-Continue

Current location: C6, R8: S6

	A	B	C	D	E	F	G	H
1	1000	1000	1000	1000	1000	1000	1000	1000
2	1000	1000	1000	1000	1000	1000	1000	1000
3	1000	1000	1000	1000	1000	1000	1000	1000
4	1000	1000	1000	1000	1000	1000	1000	1000
5	1000	1000	1000	1000	1000	1000	1000	1000
6	1000	1000	1000	1000	1000	1000	1000	1000
7	1000	1000	1000	1000	1000	1000	1000	1000
8	1000	1000	1000	1000	1000	1000	1000	1000
9	1000	1000	1000	1000	1000	1000	1000	1000
10	Tot Gross	2000	2000	2000	2000	2000	2000	2000
11	Tot Cost	200	200	200	200	200	200	200
12								
13	Total Net	1800	1800	1800	1800	1800	1800	1800

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The 22 Super VGA monitors reviewed here all performed reasonably well on PC Magazine Labs' test suite, although there was no overall performance winner. Surprisingly, monitor performance under Super VGA mode bore little correlation to performance under VGA.

TESTING ANALYSIS

SUPER VGA MODE

Although all the Super VGA monitors we tested performed relatively well on PC Magazine Labs' tests, they exhibited varying characteristics. We noted no correlation between test results in Super VGA and in standard VGA; these monitors, though capable of both modes, have design strengths only at one resolution or the other.

The Horizontal and Vertical Line Width tests showed most of these monitors producing fairly thin lines, ranging from 15.63 mils to 25.13 mils (vertical) and 15.57 to 24.90 (horizontal). A Line Width Variance greater than 0.10 (or 10 percent) indicates a less square pixel and will be noticed on-screen. Twelve

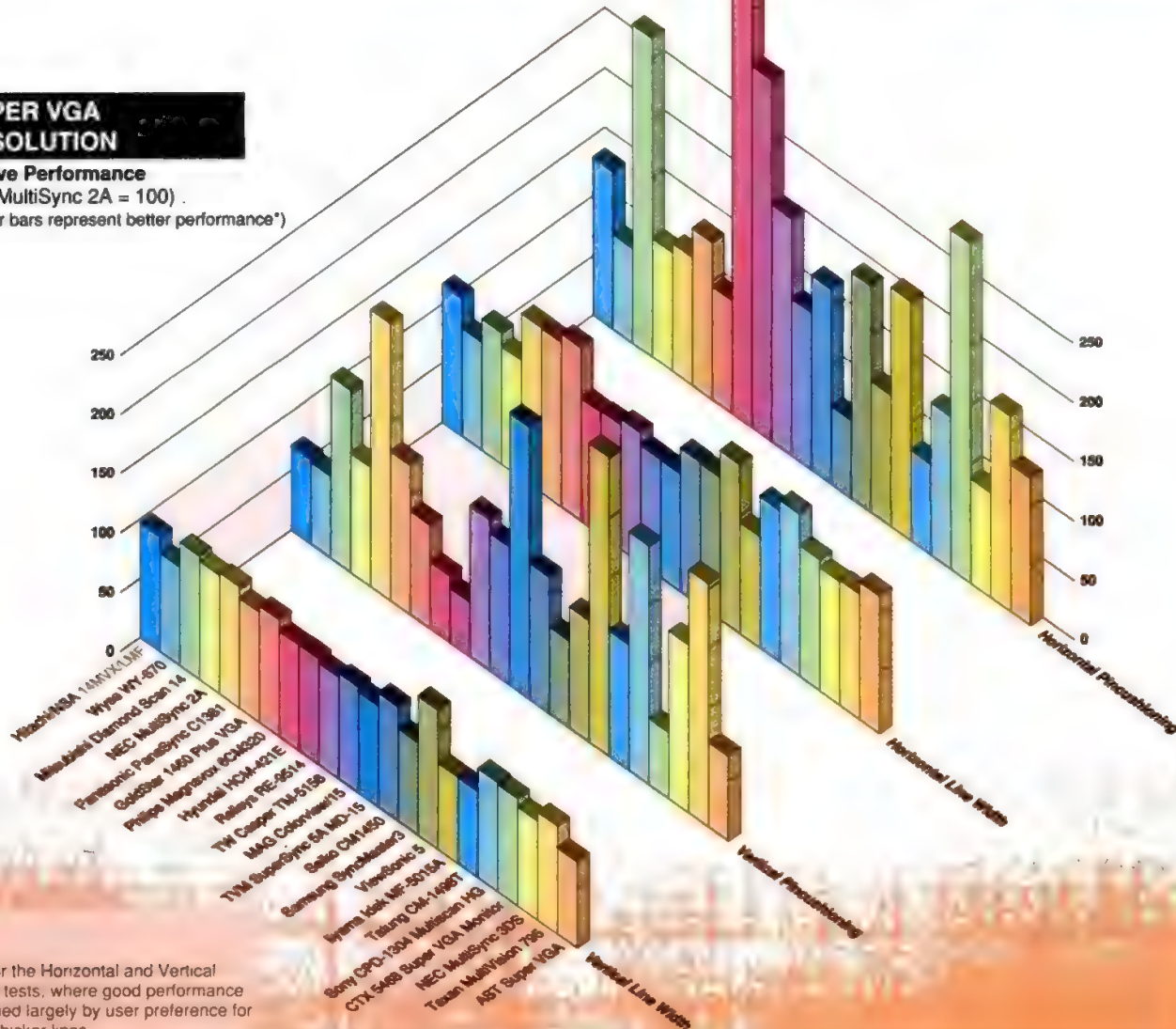
monitors yielded results within the acceptable range, with the Seiko CM1450 and NEC MultiSync 3DS providing the squarest pixels.

Our new test, Swim Ratio, shed new light on image stability. A ratio of more than 0.30 to 1 indicates visible instability; 14 monitors did better than this, with the Hitachi/NSA 14MVX/LMF and Wyse WY-670 leading the pack with the lowest figures. The AST Super VGA recorded the worst swim ratio at 0.76.

The pincushioning test results were generally good, especially when compared with line width. Pincushioning measurements greater than twice the corresponding line width will produce a visible bowing of the screen.

**SUPER VGA
RESOLUTION**

Relative Performance
(NEC MultiSync 2A = 100) .
(Shorter bars represent better performance*)



- * Except for the Horizontal and Vertical Line Width tests, where good performance is determined largely by user preference for thinner or thicker lines.

MONITORS

SUPER VGA MONITORS

image. In the Horizontal Pincushioning tests, six monitors fell into this undesirable range. The Hyundai HCM-421E rated the worst by far, with 88.00 mils of horizontal pincushioning, and the Seiko rated the best, with 12.40 mils. The Vertical Pincushioning tests yielded a much tighter grouping, with almost all the monitors performing well. The Relisys RE-9514 scored the best, at 6.40 mils, while the Iiyama Idek MF-5015A trailed the field at 34.40 mils.

Please note that convergence test results appear only for VGA mode because our test-bed is currently unable to perform this test in Super VGA.

VGA MODE

When you switch from Super VGA to VGA mode, horizontal and vertical line widths generally change little. But many of these monitors did experience some Line Width Variance degradation in VGA mode (an increase in line width variance represents a loss of pixel squareness). The Seiko CM1450 and TW Casper TM-5158 yielded the best Line Width Variance figures, at 0.01 mils and 0.02 mils, respectively.

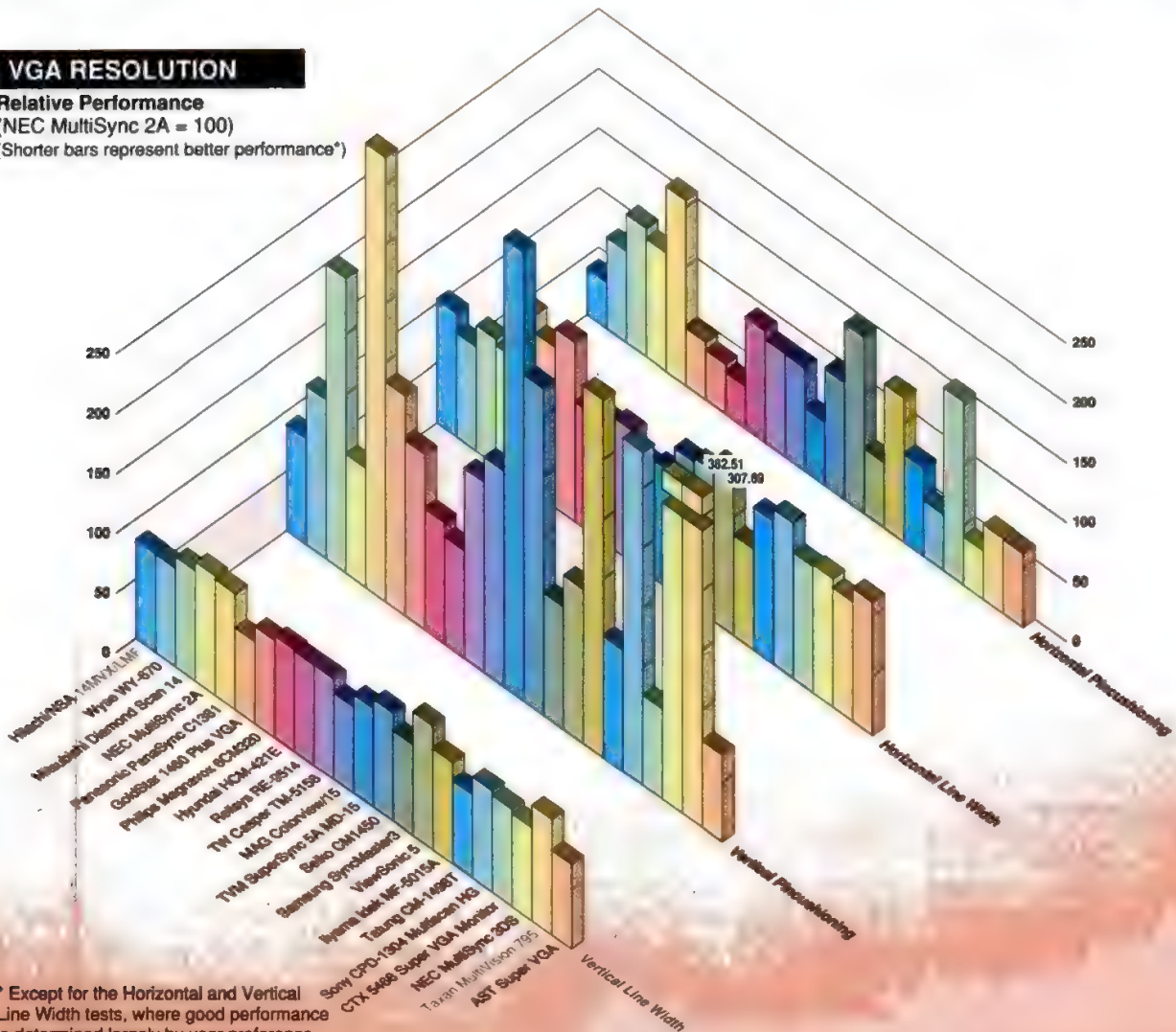
In VGA mode, 18 of the monitors had a Swim Ratio score of 0.30 or less, indicating solid image stability. The best in this category was the NEC MultiSync 2A, at only 0.13. The Taxan MultiVision 795 and the GoldStar 1460 Plus VGA significantly trailed the others; each scored 0.92.

Pincushioning problems seemed less pronounced in standard VGA mode, with the Hyundai HCM-421E achieving the best Horizontal Pincushioning score, at 11.20 mils, and the AST Super VGA having the best Vertical Pincushioning result at 7.04 mils. The Panasonic PanaSync C1381 showed the most severe horizontal pincushioning, at 49.00 mils, while the NEC MultiSync 3DS was in last place on the vertical test, at 36.30 mils.

The results of the VGA convergence tests are agreeably low in both the vertical and horizontal planes. That means that these monitors show little color separation along their perimeters. The Hyundai and GoldStar monitors had the best overall VGA convergence scores.

VGA RESOLUTION

Relative Performance
(NEC MultiSync 2A = 100)
(Shorter bars represent better performance*)



* Except for the Horizontal and Vertical Line Width tests, where good performance is determined largely by user preference for thinner or thicker lines.

CONTINUES

MONITORS

SUPER VGA MONITORS



PERFORMANCE TESTS: SUPER VGA MONITORS

SUPER VGA RESOLUTION	Vertical Line Width (mils)	Vertical Pincushioning (mils)	Horizontal Line Width (mils)	Horizontal Pincushioning (mils)	Line Width Variance (deviation from 1:1 ratio)	Swim Ratio (proportion of line width)
Hitachi/NSA 14MVX/LMF	20.87	9.79	19.87	24.90	0.05	0.17
Wyse WY-670	17.80	9.40	15.57	15.00	0.13	0.18
Mitsubishi Diamond Scan 14	22.30	21.00	18.90	50.20	0.15	0.19
NEC MultiSync 2A	21.40	13.70	16.97	18.80	0.21	0.21
Panasonic PanaSync C1381	21.93	32.00	23.67	20.30	0.08	0.21
GoldStar 1460 Plus VGA	19.90	17.20	23.63	24.90	0.19	0.22
Philips Magnavox 6CM320	21.10	12.00	24.90	18.00	0.18	0.22
Hyundai HCM-421E	19.07	7.80	17.70	88.00	0.07	0.22
Relisys RE-9514	19.17	6.40	17.87	57.20	0.07	0.22
TW Casper TM-5158	18.27	17.50	18.70	37.50	0.02	0.23
MAG Colorview/15	19.07	16.00	16.90	25.00	0.11	0.24
TVM SuperSync 5A MD-15	18.27	31.50	16.83	31.00	0.08	0.24
Seiko CM1450	20.67	15.80	20.57	12.40	0.00	0.26
Samsung SyncMaster3	16.77	10.00	20.37	36.00	0.21	0.26
ViewSonic 5	25.13	14.00	24.23	20.90	0.04	0.30
Iiyama Idek MF-5015A	15.63	34.40	15.97	38.00	0.02	0.35
Tatung CM-1498T	15.67	14.50	21.80	14.40	0.39	0.38
Sony CPD-1304 Multiscan HG	19.77	27.50	23.27	24.20	0.18	0.42
CTX 5468 Super VGA Monitor	19.43	7.65	18.77	53.90	0.03	0.48
NEC MultiSync 3DS	17.90	19.30	17.63	16.60	0.01	0.55
Taxan MultiVision 795	19.53	28.00	17.90	31.00	0.08	0.67
AST Super VGA	15.63	9.80	19.67	23.30	0.26	0.76

VGA RESOLUTION	Vertical Line Width (mils)	Vertical Pincushioning (mils)	Horizontal Line Width (mils)	Horizontal Pincushioning (mils)	Vertical-Line Convergence (mils)	Horizontal-Line Convergence (mils)
Hitachi/NSA 14MVX/LMF	19.17	8.50	17.77	12.60	4.59	4.31
Wyse WY-670	18.97	12.70	14.87	24.40	11.00	7.57
Mitsubishi Diamond Scan 14	21.23	23.50	18.03	34.20	7.36	7.01
NEC MultiSync 2A	22.93	9.49	17.10	31.40	15.00	0.58
Panasonic PanaSync C1381	22.33	35.40	25.60	49.00	12.00	13.00
GoldStar 1460 Plus VGA	15.73	17.50	22.93	15.20	3.10	4.36
Philips Magnavox 6CM320	18.73	14.00	25.73	13.00	10.10	3.29
Hyundai HCM-421E	19.73	9.70	17.30	11.20	2.40	3.30
Relisys RE-9514	19.47	8.59	18.20	29.50	4.01	8.80
TW Casper TM-5158	19.53	15.20	19.07	27.10	6.80	8.05
MAG Colorview/15	16.93	17.20	16.13	27.00	7.40	6.46
TVM SuperSync 5A MD-15	19.40	35.80	17.10	16.70	14.60	6.65
Seiko CM1450	21.20	26.00	20.97	30.90	14.80	6.91
Samsung SyncMaster3	17.83	9.79	21.57	46.50	1.00	8.97
ViewSonic 5	24.20	12.30	23.37	17.20	2.10	9.06
Iiyama Idek MF-5015A	19.83	28.50	14.47	38.00	8.20	6.61
Tatung CM-1498T	16.27	9.75	20.60	23.40	4.86	3.42
Sony CPD-1304 Multiscan HG	19.67	26.60	22.30	14.80	12.30	5.22
CTX 5468 Super VGA Monitor	18.73	7.29	18.10	48.30	4.20	4.21
NEC MultiSync 3DS	17.83	36.30	18.40	12.70	10.00	3.50
Taxan MultiVision 795	22.27	29.20	17.17	19.70	12.70	2.93
AST Super VGA	16.37	7.04	19.13	19.50	5.31	5.84

MONITORS

SUPER VGA MONITORS



FACT FILE

HOW WE TESTED

We tested the monitors for this review with the Microvision Superspot 100. This device calculates spatial relationships and uses a tiny array of photo-diodes to measure the light emitted from the screen. Using the VESA-compliant ATI VGAWonder Plus card, we drew 1-pixel-wide lines at the borders of the screen in both VGA (640- by 480-pixel) and Super VGA (800- by 600-pixel) resolution. The Superspot 100 used those lines to measure screen anomalies and image problems such as pincushioning, convergence, and swim.

Please remember that monitor performance varies among units from the same manufacturer and even within the same model. Our tests are an indication of relative performance; they do not characterize the absolute attributes of any one display.

■ **The Vertical Line Width test** measures the width of a 1-pixel-wide vertical line 1 inch above the screen's bottom right-hand corner. Three separate lines (red, green, and blue) are measured, and the resulting average is given in mils (one mil = 0.001 inch).

■ **The Vertical Pincushioning test** measures the curvature of a vertical line near the edge of the display. Pincushioning is given in terms of the maximum deviation from a straight vertical line. A smaller number indicates a straighter line.

■ **The Horizontal Line Width test** measures the width of a 1-pixel-wide horizontal line located 1 inch below the screen's top left-hand corner. Three separate lines (red, green, and blue) are measured, and the resulting average is given in mils.

■ **The Horizontal Pincushioning test** measures the curvature of a horizontal line near the edge of the display. Pincushioning is given in terms of the maximum deviation from a straight horizontal line. A smaller number indicates a straighter line.

■ **The Vertical-Line Convergence test** score represents the worst-case convergence of the three electron guns. We measured the distances between the centers of excited red, green, and blue dots within a vertical line at the screen's bottom right-hand corner, and we report the largest of the three distances. A smaller number indicates that the monitor displays less color "bleeding."

■ **The Horizontal-Line Convergence test** score represents the worst-case convergence of the three electron guns. We measured the distances between the centers of excited red, green, and blue dots within a horizontal line at the screen's bottom right-hand corner, and we report the largest of the three distances. A smaller number indicates that the monitor displays less color "bleeding."

■ **Line Width Variance** is a computed figure that indicates the deviation from an optimal 1:1 ratio between horizontal and vertical line widths. For VGA, which has nominally square pixels, a lower value indicates better pixel sizing.

■ **Swim Ratio** is a computed figure that reports swim (the distance a line moves over a 30-second period) as a proportion of average vertical line width. A lower number indicates better image stability.

Line Width Variance (deviation from 1:1 ratio)	Swim Ratio (proportion of line width)
0.07	0.24
0.22	0.23
0.15	0.19
0.25	0.13
0.15	0.24
0.46	0.92
0.37	0.20
0.12	0.22
0.07	0.28
0.02	0.20
0.05	0.29
0.12	0.24
0.01	0.31
0.21	0.23
0.03	0.23
0.27	0.21
0.27	0.26
0.13	0.44
0.03	0.26
0.03	0.22
0.23	0.92
0.17	0.28

ENDS

NEC MultiSync 2A

NEC Technologies Inc., 1255 Michael Dr., Wood Dale, IL 60191; 708-860-0335.

List Price: \$799 (tilt/swivel base and cable included).

Requires: MCGA, VGA or Super VGA graphics adapter.

Visible Diagonal Screen Size: 13 inches.

In Short: The multiple fixed-frequency MultiSync 2A covers VGA and 800-by-600 resolutions, but with only a 56-Hz vertical refresh rate. It lacks a horizontal size control knob and delivers undistinguished performance at an uncompetitive price.

CIRCLE #17 ON READER SERVICE CARD

when the monitor is using a 56-, 60-, or 70-Hz vertical refresh rate—all noninterlaced. Note that its horizontal frequency range should limit its 800-by-600 vertical refresh to 56 Hz (which is the NEC specification), although the unit tested was able to lock an 800-by-600 image at 60 Hz. The MultiSync 2A's bandwidth is rated at 38 MHz.

Switch on the MultiSync 2A, and its dark gray screen, etched against glare, glows with bright pure colors. Its shadow mask's 0.31-millimeter dot pitch is just about right at the 800-by-600 level. Sharper is always better, but the displayed characters are more than readably sharp. The only image problem demonstrated by the evaluation unit was poor convergence of the red gun; at the upper-right-hand corner of the screen, the gun was about 0.5 mm. off target. The rest of the screen was perfect.

PC Magazine Labs' tests of the MultiSync 2A were widely scattered. The monitor was the worst at vertical convergence, the best at horizontal convergence with VGA graphics, and otherwise hovered near the top and bottom of the test range. On the whole, however, everything balances out.

NEC assembles the MultiSync 2A in the U.S. and backs it with a two-year warranty on parts (including the picture tube) and one year on labor.

For a simple VGA installation with limited Super VGA power, the MultiSync 2A gets the job done. If you do not demand more than 800-by-600 resolution and are willing to endure a 56-Hz vertical refresh rate, the MultiSync 2A is an eminently usable and reasonably priced monitor.

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NEC TECHNOLOGIES INC. NEC MultiSync 3DS

by Winn L. Rosch

NEC's MultiSync 3D won an Editors' Choice last time around. This year, NEC unveiled the MultiSync 3DS. It's essentially the same monitor—with reduced emissions. It's even priced the same as the 3D: \$1,049 list, and \$950 on the street. Unfortunately, the 3DS also has the 3D's low vertical refresh rate of 56 Hz.

The MultiSync 3DS offers the same resolution as its predecessor (a maximum of 1,024-by-768 interlaced or 800-by-600 noninterlaced at a recommended vertical refresh rate of only 56 Hz). It also can accept signals from CGA upward, has the same digital controls, and has the same \$1,049 price, which should translate into a street price around \$600. Only the emissions have been changed—to protect unborn innocents from potential danger. (For more information on the emissions controversy, see the sidebar "Monitor Emissions: Should You Worry?")

For a growing number of people, the electrical and magnetic fields generated by monitors are cause for concern. The MultiSync 3DS has been redesigned to conform to strict Swedish emission safety standards and to eliminate even the residual worries of monitor users. This radiation-snuffing feature, which NEC calls reduced magnetic field (RMF) technology, involves additional shielding, a cancellation yoke, and grounding wires. Other than those changes, however, the MultiSync 3DS sticks with the proven formula of the 3D.



FACT FILE

NEC MultiSync 3DS

NEC Technologies Inc., 1255 Michael Dr., Wood Dale, IL 60191; 708-860-0335.

List Price: \$1,049 (tilt/swivel base and cable included).

Requires: Mac II, Hercules, MDA, CGA, EGA, MCGA, VGA, Super VGA, or 8514/A-compatible graphics adapter.

Visible Diagonal Screen Size: 13 inches.

In Short: A color monitor for those who look back to CGA as well as ahead to Super VGA, the MultiSync 3DS offers good autosizing and solid performance (though only a 56-Hz vertical refresh rate at 800-by-600 resolution) along with the promise of low emissions that meet Swedish radiation standards.

CIRCLE 618 ON READER SERVICE CARD

SUPER VGA MONITORS



The low-emission \$1,049 NEC MultiSync 3DS offers stable images and mostly solid performance results.

Besides its low-emission technology, the MultiSync 3DS continues its predecessor's other ergonomic features. All the controls of the MultiSync 3DS are conveniently in front—a pair of thumbwheels for brightness and contrast and pushbutton controls for digital size and position—and hidden behind a hinged door. You can adjust the image's size and position in discrete increments—almost one-sixteenth of an inch for positioning and finer ones for the size controls. Although the range of the width control is too limited to fill the screen, height range is more than adequate.

In terms of electronics, the MultiSync 3DS will serve every major video standard, thanks to a horizontal scanning frequency range that starts at 15.5 kHz and runs to 38 kHz. It will lock to vertical refresh rates from 50 to 90 Hz. It also accepts 8-, 16-, or 64-digital inputs or unlimited-color analog signals. However, it shows its age by topping out at a noninterlaced 800-by-600 resolution. According to the MultiSync 3DS's specifications, its frame rate is limited to 56 Hz in this mode, although the evaluation monitor was able to handle a 70-Hz vertical refresh rate at its top noninterlaced resolution.

With interlacing, the MultiSync 3DS will display the 1,024-by-768-pixel images generated under IBM's 8514/A or XGA standards. For the MultiSync 3DS to be truly competitive today, however, its electronics need their 45-MHz bandwidth extended to handle full 1,024-by-768 noninterlaced images.

Autosizing works by an elaborate determine-the-mode decision tree and

proved successful across all supported display standards. You can preset the size and shape you want for any of the 19 modes the MultiSync 3DS can detect.

The quality of that on-screen image rates as good. More often than not in PC Magazine Labs' testing, the MultiSync 3DS turned in results in the top third. On a couple of tests, it did not do as well. For example, it was the worst performer for the Vertical Pincushioning test at VGA resolution and the third-worst on the Super VGA swim test. Under close visual inspection, we saw slightly poor convergence on the right side of the screen.

The MultiSync 3DS comes with a standard warranty of two years for parts (including the picture tube) and one year for labor. NEC assembles the monitor in the U.S., and it has FCC Class B certification.

If you look backward rather than forward, the MultiSync 3DS is a good choice. Its low emissions may ease your safety concerns, but at its official 56-Hz vertical refresh rate for 800-by-600 resolution, your eyes may ache for something a little more advanced. If you want an NEC monitor that supports 72 Hz at Super VGA, get NEC's 16-inch MultiSync 4D, which won an Editors' Choice in our March 26, 1991, issue, or hold out for the newly announced low-emission 4DS (each of which should be available for approximately \$950).

PANASONIC COMMUNICATIONS & SYSTEMS CO.

Panasonic PanaSync C1381

by Kellyn Betts

From its line of eight color and monochrome monitors (ranging in size from 14 to 20 inches), Panasonic is offering the 14-inch-diagonal PanaSync C1381 for a low price of \$699, which should translate into a street price around \$350. This inexpensive multiscanning monitor is capable of displaying up to 1,024-by-768 interlaced resolution, and its image quality was reasonable at the VGA and Super VGA resolutions, too.

The PanaSync C1381 represents the low end of Panasonic's 14-inch lineup, which also includes the \$899 C1391 and C1395. The C1391 (see "Super VGA: Monitors with More," *PC Magazine*, May

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The \$699 Panasonic PanaSync C1381 provided a solid picture, though it was bothered by some pincushioning and convergence problems.

15, 1990) accepts digital as well as analog signals, so it is backwards compatible with the older digital standards such as EGA and CGA. It has a 0.31-millimeter dot pitch and can display up to 1,024-by-768 interlaced resolution. The C1395 is analog only, has a 0.28-mm. dot pitch, and can display up to 1,024-by-768 noninterlaced mode. The C1395 is the only one of these three to offer the 72-Hz vertical refresh rate standardized by VESA for 800-by-600 mode, though both the C1381 and C1391 are capable of using this rate for standard VGA resolution.

The PanaSync C1381 offers a lot to the dedicated VGA and Super VGA user. The FCC Class B-certified monitor has a fine 0.28-mm. dot pitch and a high-contrast black tube. Its low price includes a tilt/swivel base and nondetachable power and monitor cables, the latter with a 15-pin

MONITORS SUPER VGA MONITORS

mini D-sub connector. Following NEC's precedent, its six controls are conveniently located on the monitor's front, under a panel (besides the usual brightness and contrast controls, there are also controls for horizontal and vertical positioning and size). The monitor is not programmable, but it features factory-programmed auto-sizing settings for VGA and Super VGA. The PanaSync's user manual is brief but sufficiently informative, and everything is backed up by the standard one-year parts-and-labor warranty.

Performance testing began favorably, with the numbers showing that horizontal and vertical lines were acceptably close to the same width. However, the greater luminance of the horizontal lines makes them appear wider, although this may also be due to gun alignment problems in our test unit. Also, in VGA resolution, the unit exhibited mediocre convergence results. And while it showed no tendency to swim uncontrollably, the image did exhibit quite a bit of pincushioning at its periphery in both resolutions.

While this model's list of imperfections is long, the PanaSync C1381's problems are not so major as to remove it from many people's consideration. If low price is a concern for you, the PanaSync C1381's conveniently located controls and its auto-sizing capabilities may outweigh its image weaknesses.

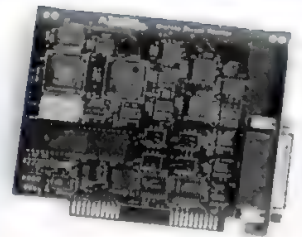
PHILIPS CONSUMER ELECTRONICS CO.

Philips Magnavox 6CM320

by Mitt Jones

Philips Consumer Electronics Co. has taken an unusual tack to meeting customers' Super VGA monitor needs. Instead of offering one monitor capable of handling two or three Super VGA vertical refresh rates, it offers two monitors—one that supports Super VGA resolutions only at the VESA guideline of 56 Hz, and another that supports the 60-Hz guideline. This approach allows the monitors to maintain a constant image size across VGA and Super VGA modes with little additional expense—a convenience feature omitted by a surprising number of monitor manufacturers. The disadvantages are that you

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Panasonic PanaSync C1381

Panasonic Communications & Systems Co., Office Automation Group, Div. of Matsushita Electric Corp. of America, 2 Panasonic Way, Secaucus, NJ 07094; 800-742-8086, 201-348-7000.

List Price: \$699 (tilt/swivel base and cable included).

Requires: Mac II, MCGA, VGA, Super VGA, or 8514/A-compatible graphics adapter.

Visible Diagonal Screen Size: 14 inches.

In Short: The PanaSync C1381 has a low price that buys many desirable features. But if you need a 72-Hz vertical refresh rate at 800-by-600 resolution, Panasonic has another analog-only 14-inch monitor to fit your bill.

CIRCLE 619 ON READER SERVICE CARD



The \$799 Philips Magnavox 6CM320 rates as a solid performer, even though it had a problem with line-width deviation.

would be better off going with the official VESA standard of 72 Hz and that you may end up with a monitor that does not work with your graphics adapter.

For this review, Philips submitted the 60-Hz-capable \$799 Magnavox 6CM320. The 13-inch-diagonal monitor comes with a tilt/swivel base and a fixed adapter cord with a 15-pin mini-DB connector. The documentation adequately illustrates hardware connection but skimps on explanatory material that novices would find helpful.

When it comes to controls, Philips managed to avoid one annoyance—the tiny turn screws that are wont to appear on the back panels of many monitors—but succumbed to a lesser inconvenience: The power switch is on the right panel of the monitor, while the vertical shift, horizontal shift, brightness, and control wheels are on the left.



FACT FILE

Philips Magnavox 6CM320

Philips Consumer Electronics Co., 1 Philips Dr., P.O. Box 14810, Knoxville, TN 37914-1810; 615-521-4316.

List Price: \$799 (tilt/swivel base and cable included).

Requires: MCGA, VGA, or Super VGA graphics adapter.

Visible Diagonal Screen Size: 13 inches.

In Short: Though its primary distinguishing virtue is its two-year warranty, the 6CM320 rates as a solid performer. Its most serious drawback is its recommended support of 800-by-600 graphics at only a 60-Hz vertical refresh rate.

CIRCLE 620 ON READER SERVICE CARD

SUPER VGA MONITORS

The Magnavox 6CM320 performed acceptably on PC Magazine Labs' tests—its display quality is what you would expect from an old pro like Philips—but two problems bear mention. On our line-width tests, the Magnavox 6CM320 consistently generated horizontal lines that were noticeably thicker to the naked eye than the vertical lines. Our performance tests bore this out, showing that in the worst case—at a 640-by-480 resolution—horizontal lines were nearly 40 percent thicker than the vertical ones.

Another complaint concerns the monitor's screen-sizing feature. The Magnavox 6CM320 maintained a relatively constant image size—9.5 inches wide and 7.25 inches long, or 12 inches diagonally—across VGA and Super VGA modes, but the screens go through a distracting period of adjustment. Instead of snapping crisply into view at the right size, they come into view for a fraction of a second at the wrong size, then implode or explode to the correct dimensions. Admittedly, this is not a major problem, but it is decidedly an irritation one could live without.

If you need a monitor capable of 8514/A graphics, you will need the \$699 Magnavox 7CM321. The 7CM321 is the 56-Hz-capable Super VGA monitor of the pair, and it is also capable of generating 1,024-by-768 interlaced graphics. By the time this issue hits the newsstand, Philips claims it will be selling two additional Super VGA monitors: the \$799 7CM329 (a low-emissions version of the 7CM321) and the \$699 6CM321 (essentially the same monitor reviewed here but with controls along the front panel).

The Philips Magnavox 6CM320, without aggressive pricing, extraordinary image quality, or far-ranging compatibility, fails to distinguish itself from its competition.

RELISYS

Relisys RE-9514

by Joe Desposito

For a list price of \$695, the Relisys RE-9514 may seem like a reasonable buy for a 13-inch-diagonal Super VGA monitor. However, when you consider the RE-9514's lack of support for a vertical refresh rate above 56 Hz in Super VGA, you



The \$695 Relisys RE-9514 performed well on PC Magazine Labs' tests, but it suffered from flicker problems.

should have reason to pause.

The only vertical refresh rate supported by the RE-9514 in 800-by-600 mode is 56 Hz. Consequently, the screen flickers noticeably when the unit runs *Microsoft Windows 3.0* in this mode. Otherwise, the monitor performed well on the PC Magazine Labs Super VGA tests. The RE-9514 was the best performer on the 800-by-600-resolution Vertical Pincushioning test, but it placed second-worst on the Horizontal Pincushioning test. On the test for which the monitor draws capital Ms on the screen, the space between the letters had a muddy appearance. Some characters, like those produced under icons in the *Windows* Program Manager, appeared slightly blurred to the eye.

The RE-9514 can be classified as a multiple-frequency monitor, supporting frequencies of 31.5, 35.2 (for 800-by-600 noninterlaced mode) and 35.5 kHz (for 1,024-by-768 interlaced mode). In this latter mode, the vertical refresh rate is 87 Hz. The RE-9514 is the only 14-inch multiple-frequency monitor that Relisys offers, but its other 14-inch model, the \$745 RE-1420, is also a multiscanning unit.

Controls for power, brightness, and contrast are conveniently placed at the front of the monitor, though other controls (vertical center, vertical size, and horizontal phase) are not only placed at the back but also set into the case so that you need a screwdriver for making adjustments. An additional control at the back is labeled "Self Test." Depressing this control (you will need a screwdriver or pointed object) turns on the display, a handy feature if you are not sure if the display or the graphics adapter is mal-



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THE CASE FOR VGA-ONLY MONITORS

Two thirds of the color monitors sold last year don't support Super VGA. If VGA is enough for you, check out the offerings from such market-leading companies as Compaq, IBM, Packard Bell, and Zenith.



by Winn L. Rosch

Of the 21 manufacturers whose products PC Magazine Labs evaluated in this review, some very big names are not represented—such as IBM and Packard Bell, the two manufacturers that sell the most monitors in America. Also missing are two technology leaders in the PC marketplace: Compaq Computer Corp. and Zenith Data Systems.

According to Stanford Resources (an industry-research firm in San Jose, California), two-thirds of the total number of color monitors sold last year cannot qualify for *any* Super VGA product review. They are VGA-only monitors incapable of handling the higher-frequency requirements of today's Super VGA display adapters. Most of the big manufacturers mentioned here do not make Super VGA monitors that qualify for this review. The exception is Packard Bell, which offers Super VGA displays, but the company did not send any for this evaluation.

THE BIG CORP.'S POSITION

IBM sells more monitors than any company in America, yet IBM has never acknowledged the 800-by-600 resolution level as a standard. Instead, Big Blue prefers the leap to 1,024 by 768—and also uses flicker-prone interlacing—for its \$950 14-inch Color Display 8515.

But the bulk of IBM's sales are of its ordinary VGA monitors. It offers two: the \$623 14-inch IBM Color Display 8512 (which has a 0.41-millimeter dot pitch) and the \$750 12-

inch IBM Color Display 8513 (which has a 0.28-mm. dot pitch). The smaller monitor is more expensive because its dot pitch is finer.

While Compaq is renowned for the high technology it builds into its PCs, its monitors are another matter. Compaq sticks with VGA, offering its 14-inch Video Graphic Color Monitor for \$699 and the 16-inch Advanced Graphic Color Monitor for \$799. (In April, Compaq discontinued its Advanced Graphics 1024 Board, which provided high-resolution support for its Advanced Graphic Color Monitor.)

Even Zenith, acknowledged as America's monitor-design technology leader (because of its Flat Tension Mask (FTM) picture tube, which is absolutely-flat-screened), avoids Super VGA territory. The latest incarnation of its FTM monitor, the \$999 second-generation Zenith ZCM-1492, has a 14-inch VGA-only screen.

Sticking with low-tech VGA obviously has nothing to do with the technical capabilities of these manufacturers. For them, the fixed-frequency choice is a practical matter. It allows them to offer less-expensive products that still get the job done—at least for those who value price over on-screen quality.

For example, according to Compaq, its monitor line offers the majority of users the most cost-effective monitor solution. To back up that statement, Compaq reports that about half of its sold systems are equipped with Compaq VGA-only monitors.

If price is your most important buying consideration, you easily might

be tempted by an ordinary VGA monitor. In fact, most VGA units will work acceptably and will deliver workable graphics at 640-by-480 resolution. But if you look to the future—or at the prices of some of the low-end Super VGA monitors that are reviewed here—you may find that Super VGA has taken the lead as today's best monitor choice.

PACKARD BELL'S RECENT ENTRY

Of Packard Bell's Super VGA displays, its PB8528SVG was not shipping in time to be included here. Introduced in April, the \$899 monitor offers 0.28-mm. dot pitch and a 45-MHz bandwidth—electronics capable of displaying XGA-style 1,024-by-768 interlaced images, the 60-Hz 800-by-600 noninterlaced mode, and all VGA modes.

Packard Bell offers a large number of 14-inch models, which differ chiefly in terms of their picture tubes. The top-of-the-line VGA PB8509VG has a 0.28-mm. dot pitch and retails for \$729. With a slightly coarser 0.31-mm. dot pitch, the PB8529VG lists for \$699. For \$100 less, you can buy the company's PB8539VG with a 0.39-mm. dot pitch.

At the low end of Packard Bell's lineup are two aperture-grille monitors, the \$539 PB8542VG with a 0.41-mm. vertical stripe pitch and the \$469 PB8552VG with a 0.52-mm. vertical stripe pitch. In truth, these two have VGA addressability, but their actual on-screen resolution falls short of true VGA because of their wide stripe pitches. ■

functioning. A cable with a 15-pin connector is built into the monitor. At a length of 58 inches, the cable is about a foot shorter than those provided with some other monitors.

The price of the RE-9514 includes the monitor, a tilt/swivel base, a built-in adapter cable, a power cord, and a small pamphlet that includes specifications and describes the monitor controls. The unit comes with a two-year limited warranty.



Relisys RE-9514

Relisys, 320 S. Milpitas Blvd., Milpitas, CA 95035; 408-945-9000.

List Price: \$695 (tilt/swivel base and cable included).

Requires: VGA, Super VGA, or 8514/A-compatible graphics adapter.

Visible Diagonal Screen Size: 13 inches.

In Short: Although it has a competitive price, the RE-9514 suffers from limited compatibility and only a 56-Hz flicker-prone vertical refresh rate at 800-by-600 mode.

CIRCLE 521 ON READER SERVICE CARD

MONITORS SUPER VGA MONITORS

To obtain service under the warranty, you return the unit to the dealer, which sends it to one of three Relisys service centers. According to a Relisys representative, repair time will be no longer than two weeks.

Relisys has a reputation for making quality monitors at good prices and for providing outstanding service (for more information, see the September 25, 1990, issue of *PC Magazine* on service and reliability). Though this may be true for the RE-9514, the monitor's lack of support for a 72-Hz or even 60-Hz vertical refresh rate makes it a poor choice for 800-by-600-mode applications.

SAMSUNG INFORMATION SYSTEMS AMERICA INC.

Samsung SyncMaster3

by Joe Desposito

Undoubtedly, the \$579 list price of the Samsung SyncMaster3 looks tantalizing. But the Super VGA monitor's lack of



The \$579 Samsung SyncMaster3's images flicker noticeably.

compliance with the official VESA-sanctioned 72-Hz vertical refresh rate—and its resulting screen flicker—can leave you looking bleary-eyed.

This 14-inch multifrequency monitor supports horizontal frequencies of 31.5 and 35.5 kHz. Vertically, the monitor's specifications include 56, 60, 70, and 86.8 Hz. However, the 70-Hz rate is not meant for 800-by-600 mode; it is used for a 720-by-400 monochrome mode. The recom-

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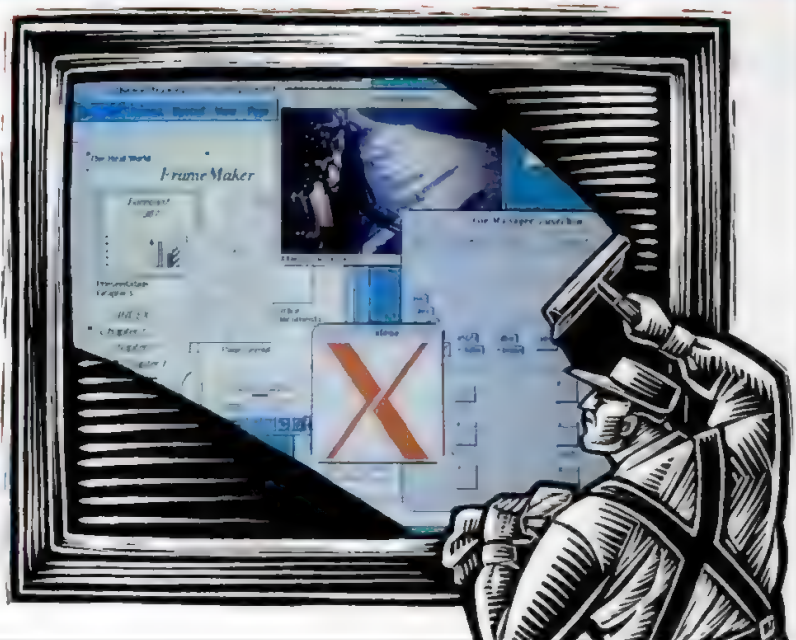
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AND SELECTION.**

Specifications	PX-14LR Low-Radiation Color Monitor	X-VIEW 14 14" Multi-Scan
CRT	14", 0.28mm dot pitch	14", 0.28mm dot pitch
Scanning Frequency	Hor: 31.5/35.5 KHz auto switch Ver: 45-90 Hz	Hor: 28-60 KHz auto switch Ver: 45-140 Hz
Video Bandwidth	45 MHz max.	80 MHz max.
Resolution	1024 x 768 (Interlaced)	1024 x 768 (Non-Interlaced)
Display Colors	Analog: infinite colors	Analog: infinite colors
Display Size	248mm x 185mm	248mm x 185mm
Power Consumption	85 watts max.	115 watts max.
Radiation	Magnetic Induction: less than 20 mVs, 30cm Magnetic Field: less than 50 nT.	
Net Weight	12.5 Kg	13 Kg
Dimensions (DxWxH)	355mm x 380mm x 347mm	355mm x 380mm x 347mm
Adaptability	IBM PS/2, 8514/A, XGA, IBM PC/XT/AT	IBM PS/2, 8514/A, XGA, MAC II series 70 Hz refresh rate X-terminal, IBM PC/XT/AT
Ergonomical Design	Built-in tilt and swivel base, non-glare screen, dark tinted glass	Built-in tilt and swivel base, non-glare screen, dark tinted glass

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CIRCLE 181 ON READER SERVICE CARD

MONITORS

SUPER VGA MONITORS



Samsung SyncMaster3

Samsung Information Systems America Inc.,
3655 N. 1st St., San Jose, CA 95134; 800-
446-0262.

List Price: \$579 (tilt/swivel base and cable
included).

Requires: VGA, Super VGA, or 8514/A-
compatible graphics adapter.

Visible Diagonal Screen Size: 13 inches.

In Short: The SyncMaster3, when working in
its rated 60-Hz-maximum 800-by-600 mode,
produces images that flicker noticeably. So
even with its low price, this monitor is difficult
to recommend.

CIRCLE 622 ON READER SERVICE CARD

mended vertical refresh rate for the SyncMaster3 in 800-by-600 mode is 56 Hz. Consequently, the screen flickers noticeably when the unit runs *Microsoft Windows 3.0* in Super VGA mode. On the PC Magazine Labs tests, the SyncMaster3 generally performed below average in VGA and Super VGA resolutions, doing well on only the Vertical Pincushioning test—placing in the top third for both these tests.

Other than the problem with flicker, the monitor displayed a good image, due to its 0.28-millimeter dot pitch, and its colors were bright and true. In tests for convergence that were done by eye, we could not detect color halos (resulting from poor convergence) when we properly adjusted the monitor. On the same test, white horizontal lines appeared wider than vertical lines, a problem not evident in normal viewing. Also, the effects of pincushioning were virtually eliminated as far as the eye could tell, due to a side-pincushion control at the rear of the monitor. Adjusting the pincushioning was a chore, though, since we had to look at the screen while reaching back to the control. When the SyncMaster3 drew capital Ms on the screen, the space between the letters had a muddy appearance. In normal viewing, though, characters appeared sharp and clear.

Controls for brightness and contrast are conveniently placed at the right side of the monitor, with five other controls (vertical center and size, horizontal phase and size, and side pincushion) placed at the back. The power switch, a big square button at the front of the monitor, just about says "Push me." The tilt/swivel

base is unlike many others you might see; it has a round base and adds very little to the total height of the monitor, saving at least an inch compared with other kinds of stands. The monitor cabinet has a perforated design that promotes continuous convection cooling—important for assuring component reliability over time. A 75-inch signal cable with a 15-pin connector is built into the monitor, as is the power cable.

Samsung offers two other 14-inch monitors for use with Super VGA. The SyncMaster2, which sells for \$559, is identical to the SyncMaster3 except for a 0.31-mm. dot pitch; the SyncMaster, which sells for \$599, is a multiscanning model.

The price of the SyncMaster3 includes the monitor, a tilt/swivel base, a built-in adapter cable and power cord, and a user manual that includes specifications and describes the monitor controls. The unit comes with a one-year parts-and-labor warranty. To obtain service under the warranty, you return the unit to an authorized service center.

Samsung is the world's largest manufacturer of monitors and the third-largest supplier of monitors in the United States. In the survey on service and reliability conducted by *PC Magazine*, the company showed it has been adept at satisfying customers (for more information, see the September 25, 1990, issue). In this case, however, the SyncMaster3 is not likely to satisfy you. The monitor's rated support of only a 56-Hz vertical refresh rate means there are better choices out there for Super VGA applications.

SEIKO INSTRUMENTS INC.

Seiko CM1450

by Kellyn Betts

Built around a Sony Trinitron tube, the \$999 Seiko CM1450 produces excellent-quality images of up to 1,024-by-768 noninterlaced resolution, and it adheres to the latest VESA standard for a 72-Hz vertical refresh rate in Super VGA mode.

Of the monitors we reviewed, the Seiko garnered some of the best performance scores on PC Magazine Labs' benchmark tests. These results correlated well with what mere visual inspection indicated. The monitor's vertical and horizontal lines



The \$999 Sony Trinitron-based Seiko CM1450 displayed some of the finest-quality images in this roundup.

were nearly identical in size in both VGA and Super VGA modes—a notable improvement over what we found when we reviewed its lower-bandwidth sibling, the CM-1440 (see "Super VGA: Monitors with More," *PC Magazine*, May 15, 1990). The on-screen images also exhibited very little pincushioning, though they had a slight inclination to swim. And while the CM1450 did have some noticeable convergence difficulties, these were largely confined to the edges of the screen where they are most likely to occur.

The CM1450's Trinitron tube has a 0.25-millimeter dot pitch, which no doubt contributed to the monitor's excellent scores. (Dot-pitch figures can be confusing for Trinitron tubes. According to Sony, the dot pitch is 0.26 mm., though the slot mask placed between the phosphor and the screen through which you see the phosphor is slotted at 0.25-mm. inter-



Seiko CM1450

Seiko Instruments Inc., PC Products Div.,
1130 Ringwood Ct., San Jose, CA 95131;
408-922-5900.

List Price: \$999 (tilt/swivel base and cable
included).

Requires: VGA, Super VGA, 8514/A-
compatible, or 1,024-by-768 noninterlaced
graphics adapter.

Visible Diagonal Screen Size: 13 inches.

In Short: Blessed with excellent imaging and
the ability to display 800-by-600 images at a
72-Hz vertical refresh rate, the Trinitron-based
CM1450 is one of the better 14-inch monitors
you can buy.

CIRCLE 623 ON READER SERVICE CARD

Now your soft fonts will be ready and waiting for you...

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Almost everyone who ends up with a Seiko Instruments high resolution color monitor starts out thinking NEC.[™]

We understand. It's a name everyone knows, and for the average computer user, a pretty good choice.

But increasingly, pretty good isn't good enough. Smart people are getting pickier about the screen they look at all day long. After all, they've invested big bucks in advanced computers and software. And being selective about monitors just plain makes good sense.

So they compare. And those picky people who choose ours have two things in common.

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Maybe it's because, unlike NEC, we start with state-of-the-art Trinitron[®] tubes. You see, Trinitron technology delivers the smallest dot-pitch for the highest image quality. And its color accuracy, purity, and saturation are unsurpassed.

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Model	CM 1440 14"	CM 1450 14"	CM 2050 20"	CM 1445 14"
640 x 480 VGA	•	•	•	
800 x 600 SVGA	•	•	•	
XGA 1024 x 768 Int	•	•	•	
1024 x 768 Non-Int		•	•	
640 x 480 MAC			•	•
1024 x 768 MAC			•	

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CM 1440

The sharpest image for business applications.



CM 2050

*PC or MAC, the precise choice for desktop publishing and CAD.
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So we add our own proprietary driving and focusing circuitry. Circuitry that insures compatibility. Reduces part count. Increases reliability. And guarantees the sharpest image imaginable. For everything from text to graphics.

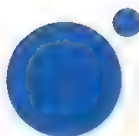
Compare our CM 1450 to the NEC 3D," for example. Ours is non-interlaced at 1024x768 for easy-on-the-eyes, flicker-free viewing. Theirs isn't. Our screen is virtually flat for glare-free clarity. Theirs isn't. We use Trinitron technology. They don't. Our misconvergence is tighter,

our dot-pitch is lower, and our price. You guessed it. That's lower, too.

For every color monitor we make, we invite you to make the same kind of comparisons. Or, simply judge with your eyes.

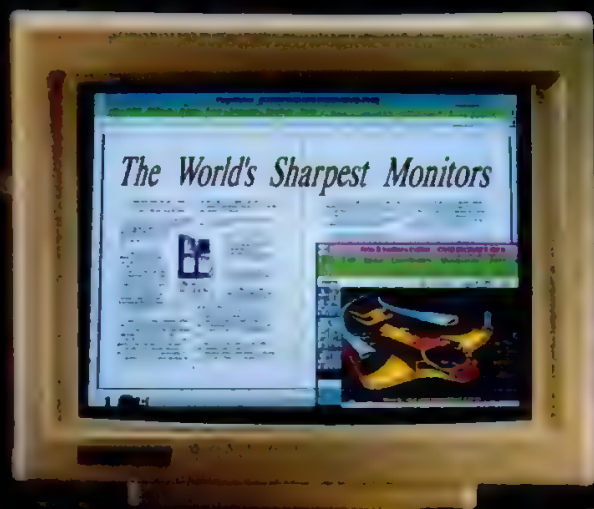
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ents Owners Think Not Even Close."



CM 1450

Non-Interlaced quality for Windows and business graphics.



CM 1445

The bright color choice for the Macintosh, including the new LC.

MONITORS

SUPER VGA MONITORS

The 22 Super VGA monitors reviewed here all have FCC Class B status. Each monitor comes with a tilt/swivel base and a mini DB-15 adapter cable. To determine each monitor's visible diagonal screen size, PC Magazine Labs measured the glass from bezel to bezel. In terms of signal compatibility, PC Labs required that each monitor accept the frequency range of standard resolutions, but keep in mind that these monitors all support software written for modes below VGA.

vals.) Support for VESA's official standard for a 72-Hz vertical refresh for both 800-by-600 and 640-by-480 resolutions—as well as at noninterlaced 1,024 by 768—plays a part in making the display look so crisp.

Seiko now offers a line of four color monitors. Three of these, which use Sony Trinitron tubes, are aimed at IBM PC-compatible computers. The two 13-inch monitors, the CM1450 and the CM1440, can both display up to 1,024-by-

Support for VESA's official 72-Hz refresh rate plays a part in making the CM1450's display look so crisp.



SUPER VGA MONITORS: SUMMARY OF FEATURES

Products listed in alphabetical order

	AST Super VGA	CTX 5468 Super VGA Monitor	GoldStar 1460 Plus VGA	Hitachi/NSA 14MVX/LMF	Hyundai HCM-421E	Iiyama Idek MF-5015A	MAG Colorview/15	Mitsubishi Diamond Scan 14
List Price	\$695	\$565	\$799	\$895	\$629	\$995	\$1,099	\$889
PHYSICAL SPECIFICATIONS								
Visible diagonal screen size (inches)	13	13	13	13	13	14	14	13
Monitor dimensions (HWD, in inches)	12 x 14 x 14	14 x 14 x 15	14 x 14 x 15	15 x 14 x 15	14 x 14 x 15	14 x 14 x 15	12 x 14 x 16	13 x 14 x 15
Weight (pounds)	31	26	29	33	30	34	36	28
Length of power cable (inches)	74	74	74	72	36	71	70	59
SIGNAL COMPATIBILITY								
1,024 x 768 (noninterlaced)	☐	☐	☐	☐	☐	☐	☒	☐
1,024 x 768 (interlaced)	☒	☒	☒	☒	☒	☒	☒	☒
Super VGA (800 x 600)	☒	☒	☒	☒	☒	☒	☒	☒
VGA (640 x 480)	☒	☒	☒	☒	☒	☒	☒	☒
MCGA	☒	☒	☐	☐	☒	☒	☒	☒
EGA	☐	☐	☐	☐	☐	☒	☐	☒
CGA	☐	☐	☐	☐	☐	☒	☐	☒
MDA	☐	☐	☐	☐	☐	☐	☐	☒
Hercules	☐	☐	☐	☐	☐	☐	☐	☒
Mac II	☐	☐	☐	☒	☐	☒	☒	☒
Apple II GS	☐	☐	☐	☐	☐	☐	☐	☒
OPERATIONAL FEATURES								
Maximum noninterlaced resolution (pixels)	800 x 600	800 x 600	800 x 600	800 x 600	800 x 600	800 x 600	1,280 x 1,024	800 x 600
Maximum interlaced resolution (pixels)	1,024 x 768	1,024 x 768	1,024 x 768	1,024 x 768	1,024 x 768	1,024 x 768	1,024 x 768	1,024 x 768
Video bandwidth (MHz)	45	45	36	45	30	30	100	30
Vertical scanning frequency range (Hz)	56-87	50-90	50-87	50-120	56.2-87	50-90	50-120	45-90
Horizontal scanning frequency range (kHz)	31.5-35.5	30-38	31.5-35.5	30-40	31.5-35.5	15.5-38.5	30-68	15.8-38
Phosphor persistence	Medium-short	Medium-short	Medium-short	Short	Medium-short	Short	Medium-short	Medium-short
Dot pitch (millimeters)	0.28	0.28	0.28	0.28	0.28	0.31	0.28	0.31
Input connectors:								
Analog D-sub	15-pin mini	15-pin mini	15-pin mini	15-pin mini	15-pin mini	15-pin standard	15-pin mini	25-pin mini
Digital/TTL	☐	☐	☐	☐	☐	☒	☐	☒
CONTROLS								
Brightness	☒ (analog)	☒ (analog)	☒ (analog)	☒ (analog)	☒ (analog)	☒ (analog)	☒ (analog)	☒ (analog)
Contrast	☒ (analog)	☒ (analog)	☒ (analog)	☒ (analog)	☒ (analog)	☒ (analog)	☒ (analog)	☒ (analog)
Horizontal position	☒ (analog)	☒ (analog)	☒ (analog)	☒ (analog)	☒ (analog)	☒ (analog)	☒ (digital)	☒ (analog)
Vertical position	☒ (analog)	☒ (analog)	☒ (analog)	☒ (analog)	☐	☒ (analog)	☒ (digital)	☒ (analog)
Horizontal size	☐	☐	☒ (analog)	☒ (analog)	☐	☒ (analog)	☒ (digital)	☒ (analog)
Vertical size	☒ (analog)	☒ (analog)	☒ (analog)	☒ (analog)	☒ (analog)	☒ (analog)	☒ (digital)	☒ (analog)
Pincushioning	☐	☐	☐	☐	☐	☐	☐	☐
Convergence	☐	☐	☐	☐	☐	☐	☐	☐
Degaussing	☐	☐	☐	☐	☐	☐	☐	☐
120/240-volt switch	☐	☐	☐	☐	☐	☐	☐	☐

— Editors' Choice

☒ — Yes

☐ — No

MONITORS

SUPER VGA MONITORS

768 resolution, but you pay \$100 less for the CM-1440 because its display is interlaced. Additionally, the autosizing feature present in the CM-1440 has been removed from the CM1450.

Besides autosizing, the CM1450 lacks other features found on some monitors. It does not accept digital signals, is not programmable, and has only six image controls, all of which are analog. The power, contrast, and brightness switches are located on its right side, while the horizontal and vertical size and positioning knobs are on the back of the monitor. All of these

features are discussed in its brief but thorough manual, as is its one-year parts-and-labor warranty—the usual for monitors. The CM1450's price does include nondetachable power and adapter cables, the latter with a mini DB-15 connector.

The CM1450 provides excellent image quality, generally good performance, support for the VESA standard of 72 Hz—all at an acceptable price.

SONY CORP. OF AMERICA

Sony CPD-1304 Multiscan HG

by Winn L. Rosch

Sony Corp. invented the Trinitron picture tube, so it is hardly a surprise that the company's CPD-1304 Multiscan HG takes advantage of that technology. The Trinitron tube delivered the second-best image quality in this roundup. And although the CPD-1304's list price is the most expensive here, it can be found for as little as \$630.

More impressive than the 14-inch tube (which is masked down to a 13-inch-diagonal viewable area) is the high horizontal frequency range of the CPD-1304's electronics. They are able to deliver a true 1,024-by-768-pixel noninterlaced image and 800-by-600 resolution at a 72-Hz vertical refresh rate. Compatibility starts with VGA, however. The CPD-1304 cannot handle digital input signals. Its horizontal scanning frequency range stretches from



The \$1,149 Sony CPD-1304 Multiscan HG showed attractive images, living up to its Sony Trinitron performance claims quite well.

28 to 50 kHz, and its vertical range is from 50 to 87 Hz, thereby embracing the interlaced 8514/A standard.

Despite the wide 50-MHz bandwidth, the electronics of the CPD-1304 is showing its age. Today, while video signals have gone analog, control is turning digital. Digital image controls give you the flexibility to customize the size and shape of the image displayed in each video mode. But the image controls of the CPD-1304 are entirely analog. And because it is difficult to design analog controls with memory, those of the CPD-1304 have none. You can not preset the size of the image on the CPD-1304 to match different display modes. In VGA modes, the CPD-1304 autosizes, but its image-sizing controls are inactive. You are factory-locked to Sony's idea of the right image size and shape—which, you must conclude, is close to perfect for the CPD-1304's tube.

A switch activates the sizing and positioning controls to allow you to adjust the image. The range of the horizontal size control is limited, however. In testing, we could not expand the on-screen image to fill the full width of the screen, although the vertical range proved broad enough to shoot the image through the top of the screen. The four image size and positioning controls are located in an inconvenient reach-around recessed area on the lower left side of the display, making what should be fine adjustments more a matter of grope and hope. Contrast and brightness are better located, tucked under the left corner of the screen.

Both power and video inputs are made to the rear of the CPD-1304. The video signal uses a 9-pin D-shell connector with

NEC MultiSync 2A	NEC MultiSync 3DS	Panasonic PanaSync C1381
\$799	\$1,049	\$699

13	13	14
14 x 14 x 16	14 x 14 x 16	15 x 14 x 14
26	30	25
66	66	80

☐	☐	☐
☐	☐	☐
☐	☐	☐
☐	☐	☐
☐	☐	☐
☐	☐	☐
☐	☐	☐
☐	☐	☐
☐	☐	☐

800 x 600	800 x 600	800 x 600
-----------	-----------	-----------

800 x 600	1,024 x 768	1,024 x 768
-----------	-------------	-------------

38	45	30
----	----	----

56-70	50-90	50-90
-------	-------	-------

31.5-35	15.8-38	30-37
---------	---------	-------

Medium-short 0.31	Medium-short 0.28	Short 0.28
----------------------	----------------------	---------------

15-pin mini ☐	15-pin mini ☐	15-pin mini ☐
---	---	---

☐ (analog)	☐ (analog)	☐ (analog)
☐ (analog)	☐ (analog)	☐ (analog)
☐ (analog)	☐ (digital)	☐ (analog)
☐ (analog)	☐ (digital)	☐ (analog)
☐	☐ (digital)	☐ (analog)
☐ (analog)	☐ (digital)	☐ (analog)

☐	☐	☐
☐	☐	☐
☐	☐	☐
☐	☐	☐

CONTINUES



Sony CPD-1304 Multiscan HG
Sony Corp. of America, 655 River Oaks Pkwy., San Jose, CA 95134; 800-222-0678. List Price: \$1,149 (tilt/swivel base and cable included).

Requires: Mac II, MCGA, VGA, Super VGA, 8514/A-compatible, or 1,024-by-768 noninterlaced graphics adapter.

Visible Diagonal Screen Size: 13 inches.

In Short: The CPD-1304 is capable of handling 800-by-600-pixel images at 72 Hz. The Trinitron picture tube delivered a very attractive image. Despite its high list price, it can be found for as little as \$630, making it an excellent value.

CIRCLE 824 ON READER SERVICE CARD

MONITORS

SUPER VGA MONITORS

Although Sony's CPD-1304 did not fare well on our tests, it provided one of the best images we saw.

a proprietary pinout diagram. Sony supplies as standard equipment the necessary adapter cable, 62 inches long, to mate the CPD-1304 to standard VGA outputs. The Trinitron tube of the CPD-1304 wears a nearly black face that is silica-coated to reduce glare. It was among the sharpest resolution monitors here with its 0.26-millimeter stripe pitch on the screen (actually 0.25 mm. on the slot mask).

One of the most significant advantages of the Trinitron tube is the lessened dis-

tance between you and the image on-screen. The vertical slots of its aperture grille allow the electron beams to light more phosphors. As a result, the CPD-1304 should have an edge when it comes to image brightness. When we used a light meter in order to compare the CPD-1304 evaluation unit with a conventional shadow-mask monitor (the NEC MultiSync 3DS), however, we found no discernible brightness difference.

The Trinitron tube did deliver on another promise. With the higher-resolution electronics of the CPD-1304 and finer



SUPER VGA MONITORS: SUMMARY OF FEATURES

Products listed in alphabetical order



Sony
CPD-1304
MultiScan HG

	Philips Magnavox 6CM320	Relays RE-9514	Samsung SyncMaster3	Seiko CM1450	Sony CPD-1304 MultiScan HG	Tatung CM-1498T	Toshiba MultiVision 795	TVM SuperSync 5A MD-15
List Price	\$799	\$695	\$579	\$999	\$1,149	\$699	\$1,095	\$895
PHYSICAL SPECIFICATIONS								
Visible diagonal screen size (inches)	13	13	13	13	13	13	14	14
Monitor dimensions (HWD, in inches)	14 x 14 x 16	14 x 14 x 15	13 x 14 x 15	14 x 13 x 15	14 x 14 x 16	14 x 14 x 16	14 x 14 x 15	15 x 15 x 16
Weight (pounds)	31	25	26	33	29	28	29	33
Length of power cable (inches)	80	72	72	72	78	54	72	72
SIGNAL COMPATIBILITY								
1,024 x 768 (noninterlaced)	☐	☐	☐	☐	☐	☐	☐	☐
1,024 x 768 (interlaced)	☐	☐	☐	☐	☐	☐	☐	☐
Super VGA (800 x 600)	☐	☐	☐	☐	☐	☐	☐	☐
VGA (640 x 480)	☐	☐	☐	☐	☐	☐	☐	☐
MCGA	☐	☐	☐	☐	☐	☐	☐	☐
EGA	☐	☐	☐	☐	☐	☐	☐	☐
CGA	☐	☐	☐	☐	☐	☐	☐	☐
MDA	☐	☐	☐	☐	☐	☐	☐	☐
Hercules	☐	☐	☐	☐	☐	☐	☐	☐
Mac II	☐	☐	☐	☐	☐	☐	☐	☐
Apple II GS	☐	☐	☐	☐	☐	☐	☐	☐
OPERATIONAL FEATURES								
Maximum noninterlaced resolution (pixels)	800 x 600	800 x 600	800 x 600	1,024 x 768	1,024 x 768	800 x 600	1,024 x 768	1,024 x 768
Maximum interlaced resolution (pixels)	800 x 600	1,024 x 768	1,024 x 768	1,024 x 768	1,024 x 768	1,024 x 768	1,024 x 768	1,280 x 1024
Video bandwidth (MHz)	32	45	45	60	50	45	50	65
Vertical scanning frequency range (Hz)	60-70	50-90	56-88.8	50-90	50-87	50-90	50-100	40-100
Horizontal scanning frequency range (kHz)	31.5-37.8	31.5-35.5	31.5-35.5	31-50	28-50	31.5, 35.5-38	30-57	31.5-48
Phosphor persistence	Medium	Short	Medium-short	Medium-short	Medium-short	Medium-short	Medium-short	Medium-short
Dot pitch (millimeters)	0.28	0.28	0.28	0.25	0.25	0.28	0.25	0.28
Input connectors:								
Analog D-sub	15-pin mini	15-pin mini	15-pin mini	15-pin mini	9-pin mini	15-pin mini	15-pin mini	15-pin mini
Digital/TTL	☐	☐	☐	☐	☐	☐	☐	☐
CONTROLS								
Brightness	☐ (analog)	☐ (analog)	☐ (analog)	☐ (analog)	☐ (analog)	☐ (analog)	☐ (analog)	☐ (analog)
Contrast	☐ (analog)	☐ (analog)	☐ (analog)	☐ (analog)	☐ (analog)	☐ (analog)	☐ (analog)	☐ (analog)
Horizontal position	☐ (analog)	☐ (analog)	☐ (analog)	☐ (analog)	☐ (analog)	☐ (analog)	☐ (analog)	☐ (analog)
Vertical position	☐ (analog)	☐ (analog)	☐ (analog)	☐ (analog)	☐ (analog)	☐ (analog)	☐ (analog)	☐ (analog)
Horizontal size	☐	☐	☐ (analog)	☐ (analog)	☐ (analog)	☐ (analog)	☐ (analog)	☐
Vertical size	☐	☐ (analog)	☐ (analog)	☐ (analog)	☐ (analog)	☐ (analog)	☐ (analog)	☐ (analog)
Pincushioning	☐	☐	☐	☐	☐	☐	☐	☐
Convergence	☐	☐	☐	☐	☐	☐	☐	☐
Degaussing	☐	☐	☐	☐	☐	☐	☐	☐
120-240-volt switch	☐	☐	☐	☐	☐	☐	☐	☐

— Editors' Choice

☒ — Yes

☐ — No

MONITORS

SUPER VGA MONITORS

pitch of its tube, an increase in sharpness was apparent on-screen. Although the CPD-1304 did not fare very well on PC Magazine Labs' test suite, the Trinitron picture tube provided one of the very best images we saw in this roundup.

Sony covers the CPD-1304 with a one-year warranty on parts and labor and a two-year warranty on the Trinitron picture tube. The monitor has FCC Class B certification.

When it comes to this class of small Super VGA monitors, Sony's CPD-1304 remains an excellent choice. It beats the

competition with its impressive image quality, high vertical refresh rate of 72 Hz, and low street price of \$630. The combination of these features, plus Sony's wide distribution, makes the CPD-1304 a very attractive product.

TATUNG CO. OF AMERICA INC.

Tatung CM-1498T

by John R. Quain

The display of the \$699 Tatung CM-1498T doesn't seem very bright compared with other monitors in this roundup, but it has no glare problems, either. This 14-inch monitor, with its 0.28-millimeter dot pitch, is able to contend well enough with interlaced 1,024-by-768 graphics adapters or noninterlaced Super VGA, VGA, and MCGA signals. And its slightly low list price means you will not feel chained to the CM-1498T if a new video standard comes along in a couple of years.

The analog-only CM-1498T has two different horizontal scanning settings: 31.5 kHz and 35-38 kHz, the former for VGA signals and the latter range to manage higher resolutions. Its 45-MHz video bandwidth precludes resolutions higher than 8514/A, however. For users concerned about image flicker, the CM-1498T will accommodate a maximum vertical refresh rate of 70 Hz in VGA mode and only 60 Hz in Super VGA.

Image sizing is factory preset for five resolutions (three VGA modes plus 8514/A and Super VGA). If you need to adjust



The \$699 CM-1498T produced reasonable performance results with only slight problems in line-width deviation and swim.

your picture, the horizontal and vertical size controls are on the front of the monitor, next to the power, brightness, and contrast controls. But to correct horizontal and vertical positioning, you have to reach around to the back of the monitor. The CM-1498T arrives with a captive video cable ending in a mini DB-15 connector, which should accommodate most of today's VGA and Super VGA graphics adapters. If this is not enough, you will have to shop for an additional adapter cable; Tatung does not offer any cable options.

Rated by the manufacturer for Super VGA vertical refresh rates between 52 and 62 Hz, the CM-1498T is unable to reach the 72-Hz level in 800-by-600 mode. At 60 Hz, the 800- by 600-pixel image cannot be adjusted out to the full width of the screen, although its vertical height is fine. Performance tests at the 56-Hz vertical refresh rate revealed average results. The CM-1498's convergence was good, and it was able to make challenging text and graphics legible—even if not as bright as possible. There was no obvious pin-cushioning or barrel distortion, though PC Magazine Labs' tests revealed rather inconsistent horizontal and vertical line widths and a swim ratio that peaked a little on the high side.

In VGA mode, image brightness improved, and the CM-1498T had no trouble with a 56-Hz vertical refresh rate. However, the monitor is rated to handle 70 Hz, and at that refresh rate, the image's vertical height was significantly reduced. Slowing down to 60 Hz did little to alleviate the problem, and the image size controls could not compensate. At 56 Hz the monitor

TW Casper TM-5158	Viewsonic 5	Wyse WY-670
\$550	\$899	\$739

14	13	13
14 x 14 x 14	13 x 14 x 16	13 x 14 x 15
31	35	30
72	72	72

☐	☒	☐
☒	☒	☒
☒	☒	☒
☒	☒	☒
☒	☐	☒
☐	☐	☐
☐	☐	☐
☐	☐	☐
☐	☒	☒
☐	☐	☒

800 x 600	1,024 x 768	800 x 800
1,024 x 768	1,024 x 768	1,024 x 768
30	85	45
56-87	50-80	55-87
31.5-35.5	31-55	31.5, 34-38
Long	Medium-short	Medium-short
0.28	0.25	0.28

15-pin mini	15-pin mini	15-pin mini
☐	☐	☐

☒ (analog)	☒ (analog)	☒ (analog)
☒ (analog)	☒ (analog)	☒ (analog)
☒ (analog)	☒ (analog)	☒ (analog)
☐	☒ (analog)	☐
☐	☒ (analog)	☒ (analog)
☒ (analog)	☒ (analog)	☒ (analog)
☐	☐	☐
☐	☐	☐
☐	☐	☐
☐	☐	☐

ENDS

PC FACT FILE

Tatung CM-1498T

Tatung Co. of America Inc., 2650 El Presidio St., Long Beach, CA 90810; 800-827-2850, 213-637-2105.

List Price: \$699 (tilt/swivel base and cable included).

Requires: MCGA, VGA, Super VGA, or 8514/A-compatible graphics adapter.

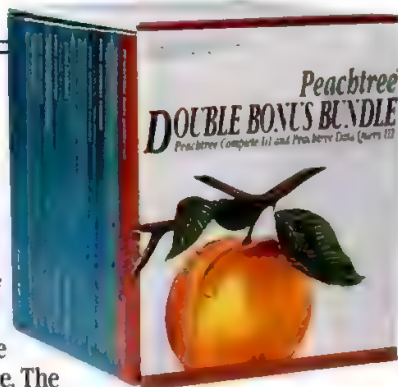
Visible Diagonal Screen Size: 13 inches.
In Short: Able to handle a recommended 80-Hz vertical refresh rate in 800-by-600 mode, the CM-1498T's reasonable price means reasonable performance. If you require more from your monitor than the ability to handle Super VGA adapters, look elsewhere.

CIRCLE 628 ON READER SERVICE CARD

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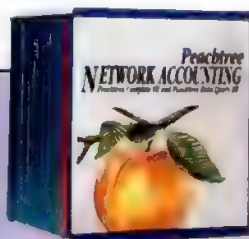


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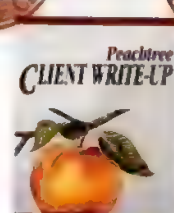
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—Karen R. Gooding
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looked most comfortable, but the image was still underscanned with approximately 0.5 inches of blank screen left on both sides. The monitor still exhibited more variance between vertical to horizontal line widths than average and had a problem with horizontal pincushioning, but it maintained good convergence.

Tatung backs all its monitors with a one-year parts-and-labor warranty and a toll-free service number. Generally, the CM-1498T will not create awe in the eyes of its beholders, but neither will users feel any particular consternation. And since Tatung sells mainly through dealers, you can expect significant discounts—necessary ones, since more than one monitor in this roundup performed comparably for around \$100 less.

TAXAN AMERICA INC.

Taxan MultiVision 795

by Kellyn Betts

Though Taxan's 14-inch MultiVision 795 is one of the few monitors in this bunch to support the VESA-approved 72-Hz vertical refresh rate, its \$1,095 price is pushing the envelope of affordability. While your money buys you some fine features, the monitor is not worth the expenditure.

Even though this analog-only monitor accepts VGA and Super VGA signals and handles up to 1,024-by-768 noninterlaced resolution, the MultiVision 795 suffered from display difficulties. Its horizontal and vertical line widths were similarly sized, but the horizontal lines appeared much clearer and brighter—a problem that



The \$1,095 Taxan MultiVision 795 was plagued by severe swim and convergence troubles.

is not unusual with Sony Trinitron tubes. Our test numbers show that the unit was plagued with serious swim problems—by far the worst when running VGA mode and not far from the bottom in Super VGA mode, either. Its convergence difficulties were so severe that they were apparent to the naked eye—even in DOS.

The MultiVision 795 does offer some attractive features. Its eight user controls, including the LED-lit power switch, are all easily accessible on the front of the display. Beyond the basic brightness and contrast controls, there are thumbwheels for horizontal and vertical size and positioning. The VGA switch is used to implement Taxan's version of autosizing: When the switch is on, it automatically centralizes and sizes the display of all VGA modes; when it is off, it allows users to store the optimal size and position for one other mode—either Super VGA or 1,024 by 768, depending on user preference.

The monitor also comes with a two-year warranty for all parts except the picture tube, which is covered only by the industry-standard one-year guarantee. Its two-color manual is more attractive than many, though it is too basic in some of its descriptions. The MultiVision 795's price also includes a detachable power cable, a mini DB-15 to mini DB-15 cable, and a tilt/swivel base. It is the only 14-inch offering in Taxan's line of high-resolution color monitors.

However, even counting these attractive features, the MultiVision 795 remains a difficult recommendation, especially when you consider its performance and price. You could do better elsewhere.

TVM PROFESSIONAL MONITOR CORP.

TVM SuperSync 5A MD-15

by John R. Quain

Flatter is better—at least as far as monitor screens are concerned. Because it uses a 15-inch Toshiba FST (flat square tube) CRT, the display on the TVM SuperSync 5A MD-15 is better than most. To that fundamental advantage, TVM adds a bright image, the capacity to handle analog graphics adapters from MCGA up to 1,280-by-1,024 interlaced mode, and a two-year warranty.

Though TVM Professional Monitor Corp.'s price for the SuperSync 5A is not as low as some of the units reviewed here, it can't be considered high-end, either: \$895 (list price) for a monitor with all the above features, plus a 0.28-millimeter dot pitch with a maximum noninterlaced resolution of 1,024 by 768 pixels, and vertical refresh rates of 60 Hz in Super VGA mode and 70 Hz in VGA. The SuperSync 5A has a video bandwidth of 65 MHz and three horizontal scanning frequencies: 31.5, 35.5, and 48 kHz.

For image sizing, there are six auto presets: three for VGA (31 kHz) and three for the higher-resolution formats (Super VGA, 8514/A, and 1,024 by 768 noninterlaced). In VGA mode, the user cannot adjust the picture. For Super VGA and higher modes, there are only a few image controls, but at least they are conveniently located up front. Next to the right-hand power switch are contrast and brightness



Taxan MultiVision 795

Taxan America Inc., 161 Nortech Pkwy., San Jose, CA 95134; 408-263-4900.

List Price: \$1,095 (tilt/swivel base and cable included).

Requires: VGA, Super VGA, 8514/A-compatible, or 1,024-by-768 noninterlaced graphics adapter.

Visible Diagonal Screen Size: 14 inches.

In Short: The MultiVision 795 we reviewed has a lot of potential, including the ability to handle 800-by-600 images at a 72-Hz vertical refresh rate. But its high price and mediocre test scores should cause you to keep searching.

CIRCLE 626 ON READER SERVICE CARD



TVM SuperSync 5A MD-15

TVM Professional Monitor Corp., 1109 W. 9th St., Upland, CA 91786; 714-985-4788.

List Price: \$895 (tilt/swivel base and cable included).

Requires: MCGA, VGA, Super VGA, 8514/A-compatible, or 1,024-by-768 noninterlaced graphics adapter.

Visible Diagonal Screen Size: 14 inches.

In Short: The bright and nearly flat display of the SuperSync 5A MD-15 delivers strong images up to a rated 60-Hz vertical refresh rate in 800-by-600 mode. This monitor should please users with DTP and CAD requirements, as should TVM's two-year parts-and-labor coverage.

CIRCLE 627 ON READER SERVICE CARD

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MVP
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November 13, 1990
Canon BJ-10e

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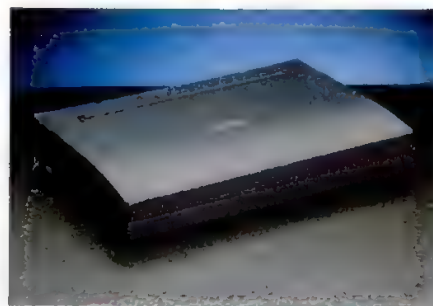
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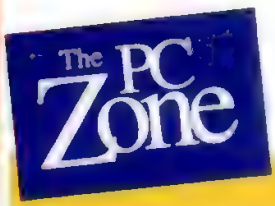
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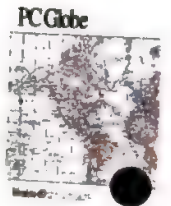
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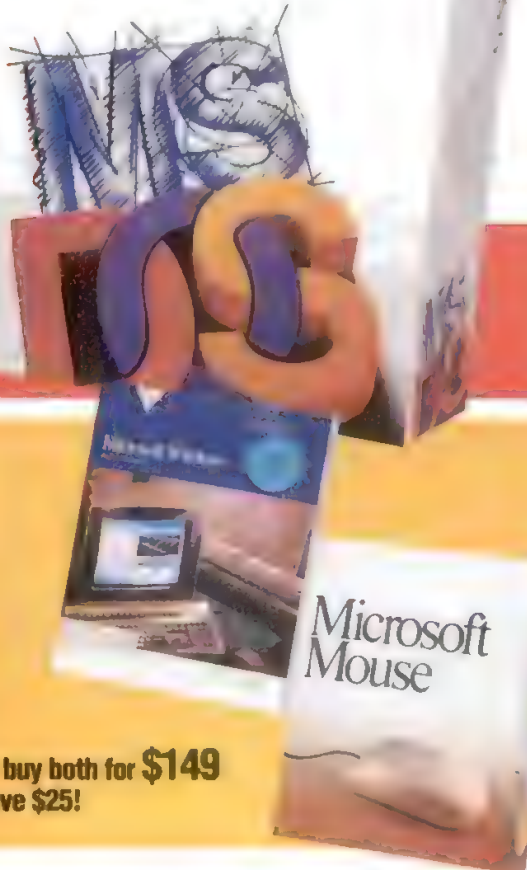
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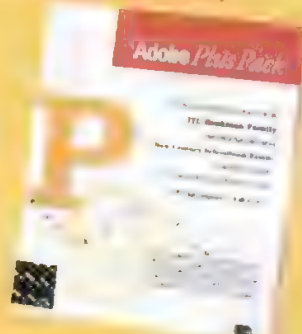
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The \$895 TVM SuperSync 5A MD-15 delivered strong images with only a minor color-contamination problem visible.

dials, with secondary analog controls for vertical size and horizontal position adjustment concealed behind a plastic flip-down panel. The supplied tilt/swivel base clips onto the bottom of the monitor for easy installation and removal. Some users, though, may feel restricted by the captive adapter cable.

In VGA mode at a vertical refresh rate

MONITORS SUPER VGA MONITORS

of 70 Hz, the SuperSync 5A's apparent brightness was immediately perceptible, delivering clean white backgrounds and stable foreground images with fully saturated colors. Tests conducted at the 60-Hz vertical refresh rate revealed the SuperSync 5A's major strength: tight and very consistent horizontal and vertical line widths. Although the TVM monitor turned in poor vertical convergence and vertical pincushioning results, neither were visible under various graphics applications.

What we did detect was some slight color contamination of 1-pixel-wide red lines in the lower right-hand corner. This occurred in both VGA and Super VGA modes. The effect appeared to be the result of strong electromagnetic interference. By turning the monitor off and on several times, we were able to degauss it sufficiently to diminish the contamination. This sensitivity, however, was still striking. In all other graphics images and tests with various colors, we were unable to reproduce the color impurity.

For Super VGA mode, the SuperSync

5A is only rated for a 56-Hz vertical refresh rate, although tests proved it could lock onto a 60-Hz signal. The narrow, consistent line widths prevailed, and the time-variance swim results were average but steady. At 60 Hz, the product would not fill the entire width of the screen, leaving nearly 0.75 inches empty on either side. Since the monitor lacks a horizontal size control, you cannot manually correct this. At its specified 56-Hz level, the images filled the screen properly, although at this refresh rate, moving objects such as a white cursor on a black background tend to leave ghost trails.

These criticisms probably won't concern mainstream users, however. TVM offers a full line of monochrome and color monitors and also OEMs its equipment to systems manufacturers, such as Swan Technologies. TVM also provides a generous two-year parts-and-labor warranty. Granted, a 72-Hz vertical refresh rate in Super VGA mode would improve the performance of this monitor, but if you want lustrous DTP or CAD images for a reasonable price, the TVM SuperSync 5A MD-15 is worth a look.

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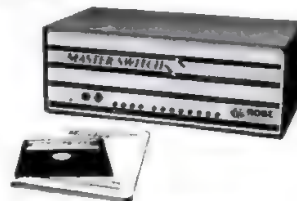
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TW CASPER CORP.

TW Casper TM-5158

by Milt Jones

With a suggested retail price of \$550, the TW Casper TM-5158 is the lowest-priced monitor in this roundup. Whether or not you should surrender to the allure of TW Casper Corp.'s aggressive pricing depends in part on how important you view the VESA 72-Hz display standard: The analog-only TM-5158 generates sharp flicker-free images and scored at least respectably well on all of PC Magazine Labs' tests, but it offers Super VGA resolution only at yesteryear's vertical scanning frequency of 56 Hz.

The TM-5158, which offers a viewing area of 14 inches diagonally, supports MCGA, VGA, Super VGA, and IBM 8514/A modes, offering a maximum resolution of 1,024 by 768 interlaced and 800 by 600 noninterlaced. It comes with a tilt/swivel base, a fixed adapter cable with a 15-pin mini DB-15 connector, and a 12-month parts-and-labor warranty serviced through the manufacturer. The documentation does an acceptable job of showing cable connections but contains a few bits of out-of-date information. It is also sparse and poorly written.

TW Casper Corp. built the primary controls—power, brightness, and contrast—into the front of the chassis at the bottom right. You will find five additional controls along the back panel. The only switch of the crowd—a three-position slider with settings marked VGA, 800 by 600, and IBM 8514/A—actually works only as a two-position switch, setting compatibility to either VGA and Super VGA or 8514/A modes. Plastic caps cover two of the four turn-screw controls: horizontal hold and "horizontal phase 1," which are marked in the manual for use only by service personnel (the horizontal-phase-1 control centers the picture in 8514/A mode). Two additional turn-screws control vertical size and horizontal centering in VGA and Super VGA modes.

The monitor supports vertical refresh rates of 56, 60, 70, and 87 Hz, but not at all horizontal frequencies. It appears to support the MCGA/VGA scan rate of 31.5 kHz at 56, 60, and 70 Hz, though the documentation fails to mention VGA compatibility with the 56-Hz rate. At Super VGA's 800-by-600 resolution, the monitor supports a vertical refresh rate of only 56 Hz, according both to the manual and

SUPER VGA MONITORS



The \$550 TW Casper TM-5158 exhibited solid performance and consistent line widths.

PC Magazine Labs' tests. A hopeful attempt to disregard this information will lead you to a hopelessly out-of-sync screen at 72 Hz. At 60 Hz, the monitor displays a nice image, but you will have to adjust the centering each time you move to or from the Super VGA mode. You will need to set your graphics adapter to a vertical refresh rate of 56 Hz if you'll be jumping the 800-by-600 mode often.

The TM-5158 avoids flicker at the 56-Hz vertical refresh rate by using a long-persistence phosphor; the dot glows longer between passes of the electron gun to compensate for the slow refresh rate. The disadvantages of using a long-persistence phosphor, all other factors being the same, include a reduction in image sharpness, but our evaluation unit showed no tendency toward fuzzy images, thanks in part to its 0.28-millimeter dot pitch.



FACT FILE

TW Casper TM-5158

TW Casper Corp., 47430 Seabridge Dr., Bldg. A, Fremont, CA 94538; 415-770-8500.

List Price: \$550 (tilt/swivel base and cable included).

Requires: MCGA, VGA, Super VGA, or 8514/A-compatible graphics adapter.

Visible Diagonal Screen Size: 14 inches.

In Short: With the lowest price in this roundup, bargain hunters will find the TM-5158 appealing. It supports 800-by-600 resolution at a vertical refresh rate of only 56 Hz, but it performs solidly if not exceptionally within this limitation.

CIRCLE 628 ON READER SERVICE CARD

The monitor performed at least equally as well in other respects during testing. When switching between VGA and Super VGA modes, the TM-5158 maintained a near-constant screen size without the annoying compensation period some monitors exhibit. Our PC Labs tests bore out other subjective naked-eye judgments: The monitor exhibited moderate but forgivable problems with pincushioning and convergence, but it held an admirably consistent line width.

Like the \$680 Casper 5156H before it (see "Super VGA: Monitors with More," *PC Magazine*, May 15, 1990), the TM-5158 is a no-frills Super VGA monitor that does a fine job. Its lack of support for Super VGA resolution at 60 and 72 Hz and its lesser drawbacks make it a difficult monitor to wholeheartedly endorse, but it is certainly worth a look if you need Super VGA resolution on a tight budget.

VIEWSONIC

ViewSonic 5

by John R. Quain

Intended for DTP and CAD users, the ViewSonic 5 has several features that will appeal to this audience. Unfortunately, critics may find that this monitor's performance falls a little short and the \$899 list price a little high compared with others that offer more.

Constructed around a vertically flat 14-inch Sony Trinitron CRT with a 0.25-millimeter dot pitch, the ViewSonic 5 will handle VGA, Super VGA, 8514/A, and 1,024-by-768 noninterlaced resolutions. Using an optional adapter cable (it comes standard with a captive mini DB-15 adapter cable), the analog-only monitor will manage Mac II graphics as well.

The ViewSonic 5 has a horizontal scanning frequency range of 31 to 55 kHz, a vertical scanning frequency range of 50 Hz to 90 Hz, and a video bandwidth 65 MHz. It does not support true autosizing, however. ViewSonic uses the more common approach of factory presets, of which there are seven on this monitor (six for VGA and higher resolutions and one for Mac II). If you encounter sizing disparities, you will find all the controls—power, brightness, contrast, horizontal position, vertical position, horizontal size, and vertical size—within easy reach on the front panel.

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<i>Cabinet depth</i>	453mm	475mm
<i>Controls</i>	On/off up front Degauss up front pincusion up front	On/off recessed Degauss in back None
<i>Modes</i>	Supports EGA	None
<i>Retail price</i>	\$1499	\$1499

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Samsung 17" flat screen SyncMaster 4



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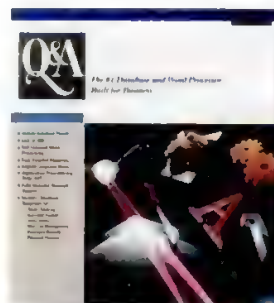
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MONITORS

SUPER VGA MONITORS



The Trinitron-based \$899 ViewSonic 5 had some of the widest line widths we encountered and also had a slight roping problem.

brightness, the standard ViewSonic 5 model does not use a nonglare screen. For those who don't appreciate seeing their own reflection in the CRT's glass, ViewSonic offers a nonglare option for an additional \$25.

Under the unwavering scrutiny of PC Magazine Labs' Microvision Superspot 100 testing equipment, this monitor yielded two particularly noteworthy Super VGA measurements. The ViewSonic 5 produced consistent horizontal and vertical line widths, but the 1-pixel-wide lines were some of the widest among this group. Nevertheless, color purity and saturation were good, if somewhat lacking in brightness, and the sharp transitions between closely spaced letters were clear.

The proportion of the ViewSonic 5's Super VGA images revealed a slight pin-cushioning problem with vertical lines.



FACT FILE

ViewSonic 5

ViewSonic, 12130 Mora Dr., Santa Fe Springs, CA 90670; 213-946-0711.

List Price: \$899 (tilt/swivel base and cable included).

Requires: Mac II, VGA, Super VGA, 8514/A-compatible, or 1,024-by-768 noninterlaced graphics adapter.

Visible Diagonal Screen Size: 13 inches.

In Short: The ViewSonic 5 utilizes a Sony Trinitron CRT. Unfortunately, with its high list price, 800-by-600 vertical refresh rate of only 56 Hz, and average performance, it may not warrant the expense.

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Vertical lines on the Sony Trinitron tube also proved to be less well defined than those on the horizontal, exhibiting a slight roping effect.

The ViewSonic 5 was barely able to manage a 70-Hz vertical refresh rate in VGA mode. Using the manual controls to adjust the display still left over 0.75 of an inch missing from both the top and bottom. At the slower 60-Hz rate, we still could not fill the screen and had to settle for a blackened-out 0.25 of an inch on the sides and 0.75 of an inch on the top and bottom. A 56-Hz vertical refresh rate turned out to be optimum for this monitor; at this frequency, the ViewSonic 5 produced a full image and brighter colors, and the display's overall brightness increased.

Like many of the monitors in this roundup, although the ViewSonic 5 is able to reach 60- and 70-Hz vertical refresh rates, it seems happiest when operating at 56 Hz. Furthermore, its 1-pixel-wide lines are very consistent but a little fat. You get a Trinitron tube, 1,024-by-768 noninterlaced resolution, toll-free technical support, and one-year parts-and-labor coverage, but also you get a low vertical refresh rate and only average performance.

WYSE TECHNOLOGY

Wyse WY-670

by Mitt Jones

The Wyse WY-670 joins the Wyse Technology models of the past in offering image quality few monitors can rival. The \$739 analog-only monitor supports a generous range of scanning rates and comes with several nice touches like a removable adapter cable and substantive documentation. Though the monitor lacks automatic sizing when switching across VGA, Super VGA, and 8514/A modes, the WY-670 renders this omission more or less moot because it has the ability to remember the appropriate size once you have set it.

Like most of the monitors reviewed here, the WY-670 lacks support for the 72-Hz VESA Super VGA standard, but it offers more signal flexibility than much of its competition. In addition to support for 1,024-by-768 interlaced graphics, you will find support for both the 56-Hz and



The \$739 Wyse WY-670 displayed admirable images and had only a minor convergence deficiency.

60-Hz VESA guidelines for 800-by-600 graphics. The WY-670 also supports numerous VGA scanning and vertical refresh rates, including the VESA 72-Hz rate, and throws in full Mac II support for good measure.

The monitor comes with a tilt/swivel base, a removable adapter cable with 15-pin mini DB connectors, and a small signal adapter for connection to the Mac II. Wyse placed the power, brightness, and contrast controls along the right panel of the monitor but relegated the vertical size, horizontal size, and horizontal position knobs to the back panel.

In a refreshing departure from other monitor manufacturers, Wyse seems to view its documentation as something more than an installation diagram with specifications and a radio interface statement attached: The manual includes explanatory material and a brief troubleshooting section.

The display quality of the WY-670 rates no less than excellent, as assessed both by the naked eye and the Microvision Superspot 100 testing apparatus. The only aspect of measured performance in which the WY-670 did not excel was convergence, but this apparent deficiency did not detract significantly from the display's overall sharpness. Another slight problem: The entire screen image was rotated noticeably, if slightly, in relation to the chassis frame. This anomaly was probably caused by slight damage during shipping, but it could signal a weakness in the monitor's mechanical design; the inevitable trauma of shipping constitutes a tricky design problem for any monitor manufacturer.

The WY-670 did a nice job of main-

A person is shown in profile, working at a desk in a dimly lit room. They are using a computer with multiple monitors. The room has large windows in the background, some of which are covered with patterned curtains. The overall atmosphere is dark and somewhat mysterious.

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CIRCLE 111 ON READER SERVICE CARD



FACT FILE

Wyse WY-670

Wyse Technology, 3471 N. 1st St., San Jose, CA 95134, 800-438-9973

List Price: \$739 (tilt swivel base and cable included).

Requires: Mac II, MCGA, VGA, Super VGA, or 8514/A-compatible graphics adapter.

Visible Diagonal Screen Size: 13 inches

In Short: Though the Wyse WY-670 supports a rated vertical refresh rate of only 60 Hz in 800-by-600 mode, it can handle a respectable range of scanning frequencies. The monitor also comes with quality touches such as a removable adapter cable and substantive documentation—all for a fairly competitive price

CIRCLE 630 ON READER SERVICE CARD

taining a constant screen size across VGA modes. When first bumped up to Super VGA resolution, the monitor reduced the size of the image vertically and shifted it horizontally, but it always returned without fail to the appropriate position and sizing once we used the controls to manually adjust it.

Wyse, reportedly second only to IBM in sales of terminals worldwide, fared poorly on the *PC Magazine* service and reliability survey (September 25, 1990). 74 percent of the respondents reported that they would buy Wyse monitors again—the quality of product itself was not in question—but serious complaints arose concerning the technical support and repair service that buyers were getting from VARs and dealers selling Wyse monitors. (Wyse markets its Amdek brand of monitors primarily as separate components through retail channels; it sells Wyse monitors—along with Wyse graphics adapters, terminals, and PCs—primarily through distributors and VARs.) Wyse seems to be continuing its efforts to solve the problem. It will now accept monitors from end users for service, and it has begun a toll-free technical support line for end users, and has other programs in the works, including beefed-up training for dealers.

The Wyse WY-670 generates quality images. Given Wyse Technology's marketing strategy, you are most likely to find the monitor sold as part of a system package or coupled with the \$339 Wyse WY-470 graphics adapter. Whatever the deal, the WY-670 should give you little reason to turn away unless your heart is set on support for the VESA 72-Hz Super VGA standard. ■



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*MAC II is a registered trademark of Apple Computer, Inc.
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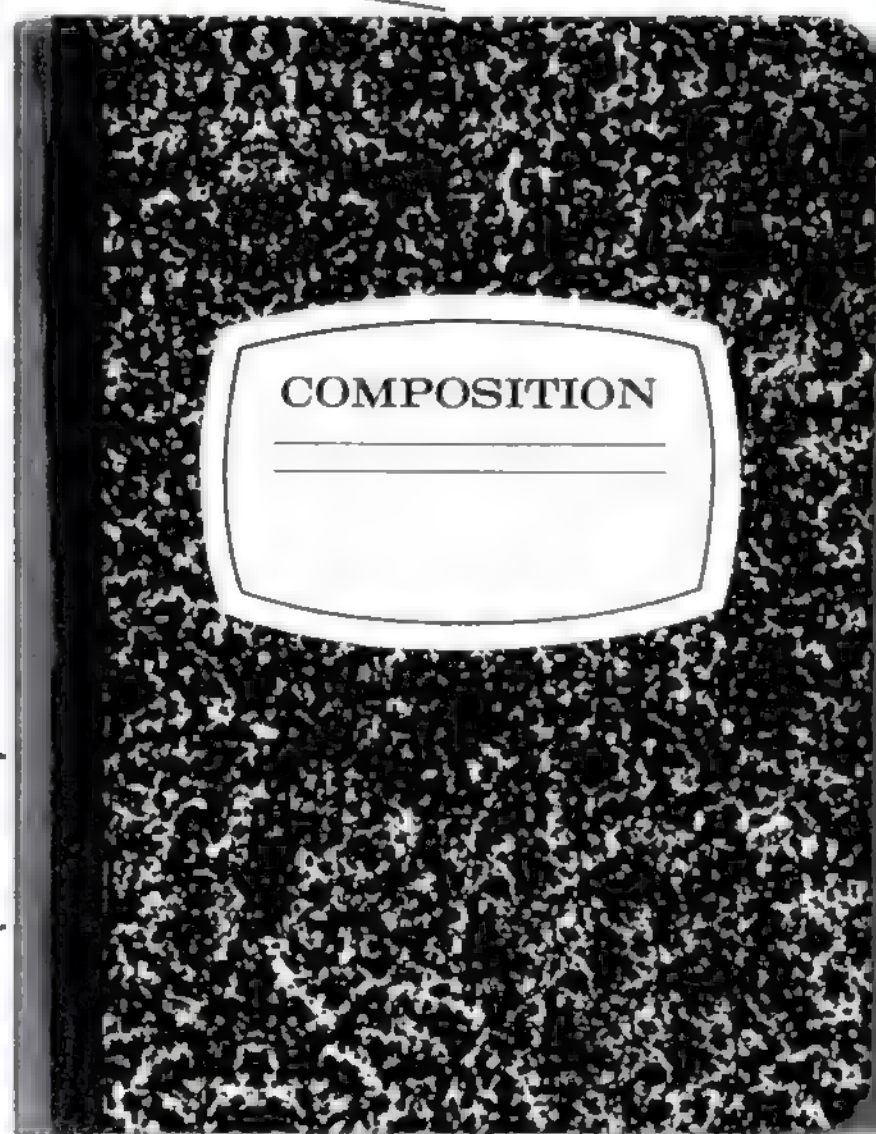
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Smaller and lighter than many daytimers and more powerful than the most complex scientific calculators, palmtop PCs are true PC adjuncts that fit in your pocket. In our first palmtop review, we present the Atari Portfolio, Casio BOSS, Hewlett-Packard 95LX, The Poqet PC, Psion Organiser II, and Sharp Wizard.



Palmtop PCs:

Power By the Ounce

by Jonathan Matzkin

Cartoon visions of the future seemed perfectly reasonable to the generation raised on a television diet in the 1960s. From 30 years' distance, the next century promised a brave new world of scientific miracles and incredible technology. Average families would bop around in flying saucers like the Jetsons and live in cities out of Isaac Asimov's most farfetched novel. And everyone would carry tiny but powerful pocket computers that would obsolete everything from paper and pencil to the telephone.

Well, the turn of the century is less than a decade away, and the family rocket ship is still at least a few

months from your Ford dealer's showroom floor. Cities, sad to say, still look about like they have for the past half-century (or perhaps worse). But, thanks to Atari, Casio, Hewlett-Packard, Poqet, Psion, and Sharp, the pocket computer has arrived, if not in the most all-powerful form we imagined.

For the moment, these lilliputian machines (palmtops, as they have been dubbed) lack the power, versatility, or the compatibility to compete with their desktop and laptop cousins. But each of the systems we review here achieves some success as a supplement to larger computers, either as a simple personal information management tool or as a true DOS workalong.

The Poqet PC, a true technological marvel, for instance, shrinks the full power of an 8088-based DOS PC down to an amazing 1-pound package, but its limited storage and relatively high price (\$1,450) make it a luxury for typical users. The Poqet won't do as a user's main system, and it's a difficult expense for many to justify. Hewlett-Packard's 95LX palmtop offers most of the Poqet's functionality (plus 1-2-3 Release 2.2 built in) in an even smaller case for a lot less money (\$699). Like the Poqet, it runs DOS, but its 40-column screen and tiny keyboard make it even less likely to serve as a primary system.

The other minuscule systems reviewed here, the Sharp Wizard OZ-8200 (\$399), the Atari Portfolio (\$299), the Psion Organiser II LZ-64 (\$420), and the Casio SF-9500 Executive BOSS (\$320) are also truly pocketable computers. However, none of these systems can legitimately claim DOS compatibility.

The Atari Portfolio comes closest: The command structure of its "DIP" operating system mimics the DOS command line interface, and it will run some simple DOS software with minor modifications. The Wizard, the Psion, and the BOSS use proprietary operating systems that require custom-written software, and both systems lack the RAM memory needed to run serious applications.

All of the palmtops but the Psion Organiser support one version or another of the newest development in storage: credit-card-sized RAM and ROM cards. Available for the Poqet in sizes up to 512K, with 1MB units on the horizon, these plug-in cards give even the smallest machines a high degree of expandability—and more data storage than their meager internal

memories would otherwise allow. But this feature is still a costly option: The least expensive storage modules hold just 64K of data and sell for more than \$100.

CAPABLE PERIPHERALS

Despite their limitations, palmtops have legitimate use as adjuncts to larger systems in the same way that early portable PCs served virtually as peripherals to more

There is a niche to be filled by machines whose main virtue is size, and which can provide ready access to data generated by other systems.

capable desktop systems. In fact, two distinct groups of people will find use for these diminutive machines: aggressive PC users who see the palmtop as an important information and communication peripheral to desktop and laptop systems, and people who will use these devices as electronic address books, schedulers and notetakers.

Manufacturers seek to avoid limiting themselves to the first group—the people who pack their laptops before their toothbrushes when taking business trips. So palmtops, almost without exception, offer some easy-to-learn, simple-to-use functionality for the second group. That might mean a memo or address-book function, or a calculator mode accessed by dedicated keys embedded in the palmtop's keyboard.

On the other hand, vendors are finding new ways to support aggressive PC users. After all, for all of the recent strides in laptop technology, there are still situations in which even 5-pound notebooks are too big, or, ironically, overqualified for certain simple tasks. Even the smallest laptop won't fit in a jacket pocket, and even 5 pounds can seem like a ball and chain when lugged from one meeting room or

trade-show booth to another. There is clearly a niche to be filled by machines whose main virtue is size, and which can provide ready access to data generated by other systems.

For the purposes of this review, we consciously chose to evaluate palmtops in terms of their value to PC users. Power users may very well like the BOSS's business card database or the Wizard's calculator mode, but they also will be concerned with how well each serves as an electronic mail terminal or container for PC data.

COMMUNICATION IS KEY

Broadly speaking, the power user should seek two main capabilities in a palmtop. First, it should be an adept communicator, both over phone lines and with PCs via cable hookups. Second, it should handle personal information management with a high level of software support.

Five of the six systems examined here support modems, and that suggests a world of useful applications. E-mail heads the list, but that's just for openers. Fax capability, exchange of files over phone lines, and access to information services like CompuServe are all a pocket-sized reality, given a palmtop and a modem.

All of the systems we looked at support palmtop-to-PC communication via cable, in much the same way that users bang files back and forth from desktop to laptop. This last communication capability, while not as exciting as carrying your e-mail around in your pocket, is perhaps the most crucial function palmtops can provide. It's not simply a matter of downloading a chunk of next quarter's budget forecast to your Wizard to take to a department meeting; when it comes to basic PC applications—spreadsheets, word processing, databases—palmtops will always be limited partners by virtue of their tiny screens and cramped keyboards. When it comes to personal information management, however, the lowly palmtop may turn out to be more than the PC's equal. For this area, the communication link is crucial.

The biggest problem with PIMs has been that when you are cut off from your desktop or laptop machine, you are also cut off from your address book, schedule, and to-do list. Paper reports are one solution, but they defeat the whole purpose of computerized PIMs. Changes made on paper must be rekeyed and reconciled later, when a user sits down in front of the



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Jim Seymour

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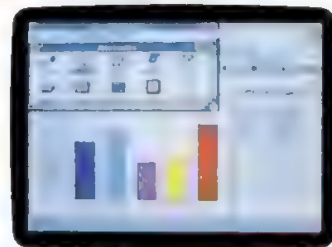
"The large-diameter ball in the Expert Mouse is so much more comfortable than the smaller balls found in all other trackballs that I'm convinced the size of the

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host PC. The ability to reconcile the host system's PIM database with information gathered by the palmtop will make information management a transparent task across a user's two systems.

At the time of this writing, Borland's *SideKick* 2.0 supports data transfer between a PC running the software and Sharp's Wizard or Casio's BOSS, with some degree of data reconciliation. Another software developer, IntelliLink, offers software that transfers data between IBM's *Current* and the BOSS and Wizard, with links to other palmtops under development. It bodes well for the future usefulness of the palmtop that third-party software publishers see them as worthy platforms for development, albeit only as peripherals. In fact, palmtops may raise the PIM category from its current lukewarm acceptance to major application

status. As pocket-sized systems proliferate, PIM software publishers will have to take them into account or risk being left behind.

REVIEW CRITERIA

In evaluating palmtops for this roundup, we eliminated machines that cannot share files with larger systems. We passed over Tandy's EC-345, which has been discontinued, and the \$699 Dataworld Pocket PC, which was due to begin shipping in June. We also chose to focus on the most feature-rich system from each vendor. Since Casio and Sharp sell several models, we discuss the lower-end versions as subsets of the product lines.

When examining these six systems, we emphasized communications ability in

terms of both file transfer and modem functions. We also considered how each would fit into an overall PIM strategy that encompasses both the palmtop and software running on a laptop or desktop system. We do not list every piece of software available for each organizer in this roundup; however, we discuss the major applications in each review.

Power users once thought of electronic organizers as computers for the great unwashed, the people who would never join the anointed ranks of PC users. But if early signs are reliable, these little machines will become increasingly integrated at the software level with larger systems. If that happens, and if palmtops' unique characteristics continue to find their niche, you may have to find room in your pocket or purse for one of these tiny gizmos in the not-too-distant-future.



EDITORS' CHOICE

● HP 95LX Palmtop PC

Of these six palmtops, our Editors' Choice, the HP 95LX Palmtop PC, best lets you carry DOS in your pocket. The Poqet PC, the only other DOS computer in this group, fits in the corner of a briefcase, if not truly in your pocket, and deserves an honorable mention for its place in the portable computing continuum. The Sharp Wizard, too, deserves honorable mention for its superior design and its wealth of software. Each of the remaining three has its place, but serious computer users will demand more from their PC adjuncts than Atari, Casio, or Psion palmtops give them.

Hewlett-Packard's 95LX is likely to change the face of palmtop computing. Its NEC V.20H processor, DOS 3.22, and 1- by 6- by 3-inch dimensions qualify it as a real pocket PC. Jointly developed by Lotus and HP, the \$699 HP 95LX lets you access 1-2-3 at a touch. Then Hewlett-Packard adds even more value, giving you a clipboard, context switching, and Lotus 1-2-3 backsolving capability (courtesy of the 95LX's calculator).

The 95LX makes data transfer simple. A single cable and software connects you to your desktop applications, and an infrared port lets

you transfer data from one LX to another—cable-free. Only the keyboard needs some improvement, to make typing a bit easier. (Sharp proves that touch-typing is possible in such a small form factor.)

HONORABLE MENTION:

POQET, WIZARD

Had Hewlett-Packard not introduced its palmtop, the Poqet PC would have stood alone. In fact, this system has some significant advantages over any of the others—even the 95LX. Most important, the screen gives you 80 characters by 25 lines, and the keyboard most closely resembles that of a laptop PC. The Poqet still has pitfalls, however. The 1- by 9- by 4-inch dimensions will relegate this unit to your briefcase, not your pocket, and The Poqet PC is still too expensive to make it truly competitive in this market. Even after a discount, the system sells for about \$1,000.

If DOS isn't a prerequisite, consider the slender, \$319 Sharp Wizard OZ-8200. This organizer is an ergonomic wonder. The screen is easy to read, and the keys could even be comfortable for touch typists. Sharp's ace-in-the-hole, a touch screen, allows software publishers to

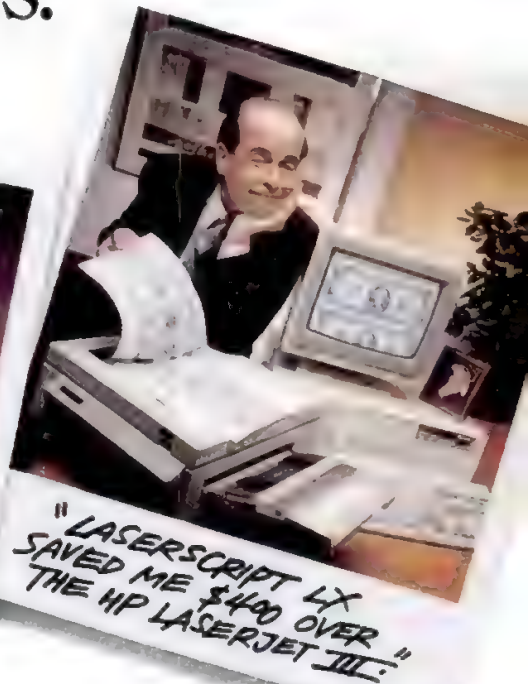
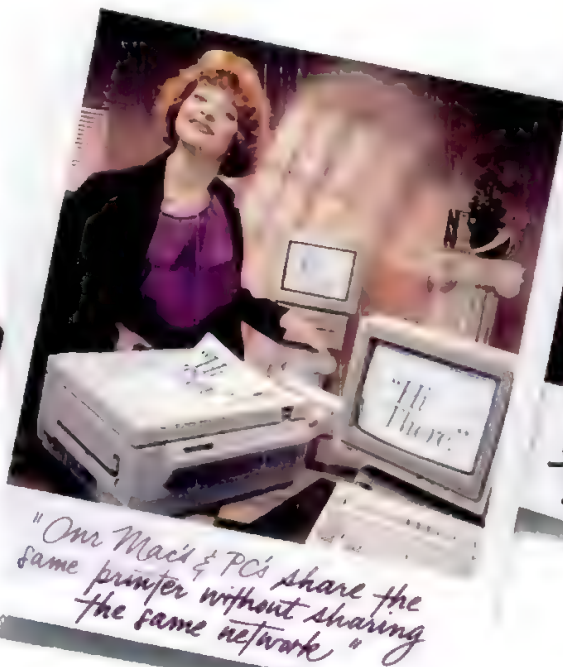
create keypads that can handle many, if not most, of their application's functions.

It's too bad Sharp didn't pay as much attention to user friendliness as it did to design. Although dozens of third-party programs are available for the Wizard, learning to use it can be difficult. Above all, the Wizard's biggest handicap is it's simply not a DOS machine.

The remaining three organizers have handicaps in size, design, or functionality that might limit their appeal to serious computer users. The \$299 Atari Portfolio, for instance, requires separate I/O modules for PC communication, adding more bulk to an already oversized system. The Casio BOSS, \$320, lacks modem support and has a tiny screen. The smaller, less expensive versions, however, may be worth considering as everyday notetakers or electronic address and phone books.

Finally, the \$420 Psion Organiser II LZ-64's alpha keyboard and tiny screen make notetaking and reading a chore. With its strong programming language, the Psion is best suited for data acquisition, inventory control, or engineering and scientific uses.

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taneously active ports — one LocalTalk, two RS-232, and one Centronics — plus automatic emulation switching, so you can switch between PCL 4 and PostScript-compatible languages.

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PALMTOP PCs:
SUITABILITY TO TASK

Whether it's a tiny computer or a daybook, a palmtop PC should be able to handle everyday tasks and communicate efficiently with PCs. DOS-based palmtops from Poqet and HP have a clear advantage because of their software compatibility.

THE TASKS

PC Magazine rates each palmtop for its suitability as a communicator, a note-taker, a budget minder, and a scheduler. These subjective ratings, on a scale from 0 to 4, are presented with each review.



Communications rates the palmtop's ability to handle modem and palmtop-to-desktop communications.



Note-taking refers to the ease with which a user can type and store memos. Higher-scoring systems have better keyboards and higher-capacity memo functions.



Personal finance ranks each palmtop's built-in or third-party software for recording, tracking, and reporting on expenses.



Scheduling refers to the ease with which appointments can be entered, viewed, and linked to desktop software.

0—Completely unsuited for the task

1—Poorly suited for the task



2—Fair

3—Good

4—Excellent for the task

ATARI CORP.

Atari Portfolio

by Jonathan Matzkin

Unlike Sharp's Wizard, Casio's BOSS, and Psion's Organizer, the 80C88-based Atari Portfolio is designed to look, feel, and work as much like a PC as possible. Its 0.6- by 7.8- by 4-inch (HWD) clamshell case resembles those of larger laptops, and its keyboard approximates a familiar PC layout, complete with Ctrl, Alt, and Esc keys in addition to the usual function keys and QWERTY alphanumerics.

The Portfolio's nonbacklit screen has better contrast than many laptops we've seen: The display is bright, readable, and easy on the eyes. The screen can be configured as a static 8-line by 40-column screen or a movable 8 by 40 "window" in a virtual full-sized 25-line by 80-column screen.

The \$299 Portfolio's DIP operating system is clearly intended to resemble MS-DOS's command-line interface. A: and C: prompts correspond to the Portfolio's card drive and RAM disk, and familiar commands such as DIR and CHKDSK are implemented much as they are under DOS.

A few familiar DOS commands differ somewhat in their DIP implementations. FDISK, for example, sizes and formats

the Portfolio's RAM disk rather than a hard disk, as under DOS. The RAM disk can be sized between 8K and a value corresponding to the maximum available internal memory. The Portfolio is shipped with 128K of internal RAM, but can hold as much as 512K.

Since the Portfolio keeps RAM alive when the machine is switched off, powering down does not obliterate the contents of the RAM disk. Consequently, you can use it as a modest hard disk equivalent, similar to the silicon drive found in Toshiba's T1000 laptop. You can reboot without losing the contents of your virtual disk by using either Ctrl-Alt-Del or the Portfolio's reset switch.

The Portfolio's complement of three AA batteries not only keeps the RAM disk alive but also gives it auto-resume capability. A tap of any key wakes up the dormant machine and takes you back where you left off.

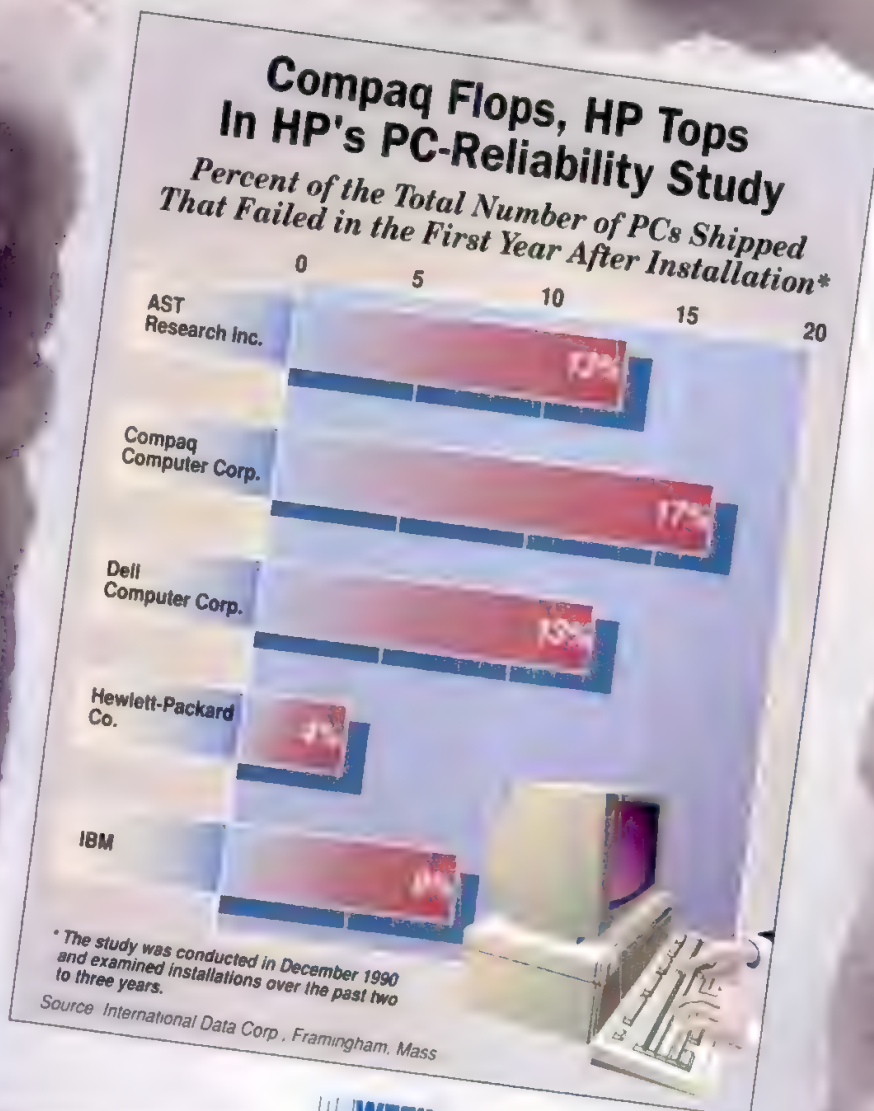
APPLICATIONS

A suite of built-in applications can be accessed via hotkey combinations (clearly marked on the Portfolio's keyboard) or by popping up a main application menu. PC users will appreciate the clear, intuitive menu structure.

The address book supports multiple files and text searches; it also has an auto-dialer that generates audible tones through the system speaker. The calculator uses an embedded numeric keypad and has a pa-



The bulky case could use a bigger screen to show off the Atari Portfolio's built-in, menu-driven applications.



PC WEEK

FEBRUARY 11, 1991

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Suitability to Task Atari Portfolio

	1	2	3	4
Communications	☐	☐	☐	☐
Note-taking	☐	☐	☐	☐
Personal finance	☐	☐	☐	☐
Scheduling	☐	☐	☐	☐

perless tape capability. The scheduler uses a standard calendar design, allows text searches, and supports multiple alarms. The editor reads and writes ASCII files, offers word wrap, and performs search and replace. Since the Portfolio keyboard is too small for fluent touch typing, it's best used for short notes.

The worksheet, a modest subset of *Lotus 1-2-3*, reads and writes .WKS files. It handles spreadsheets as large as 255 rows by 127 columns and supports 44 1-2-3 functions. When you import a sheet that contains unsupported functions, the affected functions are converted to the function @ERR.

SOFTWARE

The built-in software is adequate for many of the Portfolio's potential uses. Since the applications read and write ASCII files, data exchange with desktop software is simple. Unfortunately, no links to desktop applications yet exist to allow reconciliation of schedule or phone book records.

Surprisingly, a fairly substantial body of additional software already exists for the Portfolio. Atari and third-party publishers offer a variety of titles; and, as a perusal of CompuServe's Portfolio forum will reveal, numerous public domain and shareware titles exist. We downloaded a Portfolio version of *Emma*, *PC Magazine's* MCI Mail utility; together with

COMPUTERS PALMTOP PCs

Atari's optional serial port attachment, it worked like a charm. Many titles are also available on Atari's bulletin board, which can be reached at 408-745-5664 at 300 or 1,200 bps.

STORAGE

The Portfolio's card drive, mounted on the left side of the case, takes the place of a traditional floppy. At the time of this writing, card RAMs were available in three sizes: 32K (\$79.95), 64K (\$129.95), and 128K (\$199.95).

Lower storage prices would stimulate interest in the Portfolio's optional desktop card drive, which Atari will bundle for an extra \$100 (without a RAM card). This external drive interfaces with your desktop computer via a three-quarter-length bus card that goes into any available 8-bit slot.

The advantages of this little drive are obvious: It allows absolutely hassle-free transfer of files from the desktop to the Portfolio. You simply download the desired files to the storage card, as you would to a floppy disk, and insert the card in the Portfolio's card drive.

On the right side of the Portfolio's case, a small plastic cover conceals a proprietary expansion port that accepts peripherals from Atari and third-party developers. You can attach Atari's snap-on serial (\$49.95) and parallel (\$79.95) port modules to the expansion port one at a time. However, the extra 2.8 inches that they add to the Portfolio's width will probably consign them to your briefcase when they aren't in use. A company called XoteriX, based in West Hills, California, produces a 20MB hard disk drive (\$899, not reviewed here) for the Portfolio; the disk is contained in a docking station that also includes rechargeable batteries, parallel and serial ports, and 512K of additional RAM.

Because of its many resemblances to DOS PCs, the Portfolio will please palmtop users who are already PC literate. The substantial and growing body of hardware and software add-ons bodes well for the Portfolio's future usefulness. Our only real complaint is size: Largest of the palmtops we evaluated, the Portfolio doesn't really fit comfortably into a shirt or pants pocket. It does slip easily into a coat pocket or purse, however, and its additional size detracts not at all from its considerable functionality.

CASIO INC.

Casio SF-9500 Executive BOSS

by Jonathan Matzkin

Think of Casio's BOSS (Business Organizer Scheduling System) as the lean, mean choice among machines that compete for space on your palm and in your pocket. It makes no attempt to replicate your DOS machine's commands or run your desktop PC's software, and it has no modem support. But it supplies the core information-handling and communication functions that enable it to work together with your desktop or laptop machine. It also supplies the built-in personal information management functions that organizers were first designed to handle.

Casio offers an entire line of BOSS machines. We reviewed the current top of the line: the SF-9500 Executive BOSS (\$320), which comes with 64K of internal RAM. Its svelte dimensions (0.8 by 6.5 by 3.3 inches HWD) make the SF-9500 easier to pocket than most of the other machines considered in this roundup. It's noticeably smaller than the Sharp Wizard and significantly smaller than the Atari Portfolio.

When it comes to palmtops, small is beautiful. If size is your main concern, consider the lower-priced, smaller members of the Casio line. The BOSS SF-7600sp (\$300), for instance, offers the same 64K RAM as its larger siblings but wraps it in a diminutive 0.6-by-5.5-by-3-inch package that includes a built-in spell checker and thesaurus. As with the entire BOSS line, files can be shared by the SF-7600sp and a PC via a separately available cable-and-software combination.



FACT FILE

Atari Portfolio

Atari Corp., 1196 Borregas Ave., Sunnyvale, CA 94088; 408-745-2031.

List Price: With 128K RAM, \$299.

Options: Desktop card drive, \$100; serial port module, \$50; parallel port module, \$80; 32K RAM card, \$80; 64K RAM card, \$130; 128K RAM card, \$200.

In Short: The Atari Portfolio packs a surprising amount of DOS-like functionality into its palmtop case. The menu-driven built-in applications are powerful enough to handle most ordinary tasks, and a surprising body of third-party software, much of it available on bulletin boards, adds to the portfolio's usefulness.

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FACT FILE

Casio SF-9500 Executive BOSS

Casio Inc., 570 Mt. Pleasant Ave., P.O. Box 7000, Dover, NJ 07801; 201-361-5400.

List Price: With 64K RAM, \$320.

Options: 64K RAM card, \$130; 128K RAM card, \$200; PC-Link, \$130.

In Short: The Casio BOSS offers good desktop connectivity and internal applications in an appealingly small package. For those concerned with size, Casio offers a range of extremely small units, all of which can share files with PCs. Modem support is absent, but Casio may do something about that before very long.

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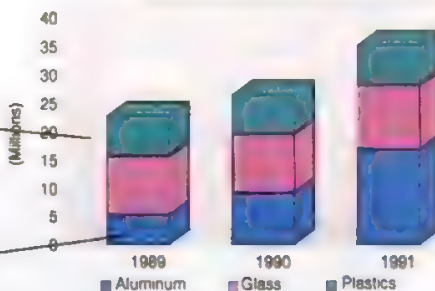
The Materials Research Group Recommendation:

FOCUS Aluminum

This study conducted by the Materials Research Group provides the basis for our most recent recommendation that WeCycle continue to expand its aluminum recycling capacity by another 70% over the next 6 years. The graph to the right shows the increasing proportion of our business provided by the aluminum division during the past three years, now approximately half of all revenues. It is our opinion that, at this rate of growth, aluminum recycling will continue to offer our company its greatest opportunity for expansion over the next decade, and certainly into the 21st century.



Gross Revenues by Product



Glass and Plastics

As can be inferred from the graph to the left, glass and plastics recycling has been holding steady throughout this same period, and has consequently become a smaller proportion of our overall sources of revenue.

Although this group would strongly recommend that WeCycle Waste Corporation do all that is necessary to increase its activities in these areas, our studies have shown that aluminum will become increasingly the material of choice in the shipping, heavy manufacturing and container industries.

Aluminum

It is our opinion that sources of aluminum products will be pressed close to their limits over the next decade.

Therefore, we propose that WeCycle Waste Corporation invest in more aluminum capacity during the next five years in order to take the best advantage of this increasing market demand.

WECYCLE PRODUCT	1989	1990	1991
Aluminum			
East	2,323,426	4,019,527	7,315,539
Central	1,372,347	2,374,160	4,320,972
West	1,726,492	2,986,831	5,436,033
Total	5,422,265	9,380,518	17,072,544
Glass			
East	2,496,721	2,567,821	2,798,925
Central	3,598,757	3,217,693	3,507,285
West	4,217,635	4,471,294	4,873,710
Total	10,313,113	10,256,808	11,179,920
Plastics			
East	2,897,493	3,171,243	3,234,668
Central	1,873,938	1,823,697	1,860,171
West	2,378,942	1,967,421	2,006,769
Total	7,150,373	6,962,361	7,101,608

de your spreadsheet ng your hardware.

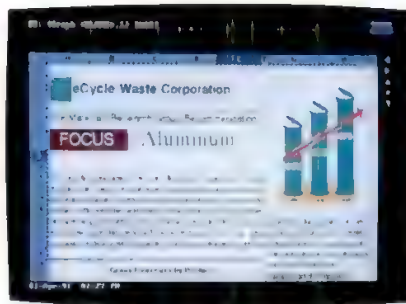
There's a lot to like about the new Lotus® 1-2-3® Release 2.3.

For starters, it's not just a graphical spreadsheet. It's a fast, graphical spreadsheet for DOS. It's easy to use. And it works as well on an older XT with just 512K of memory as it does on the newest 486 machine.

It also shares many features in common with our powerful 3D spreadsheet, Release 3.1.

Including its superb spreadsheet formatting and publishing capabilities and full mouse support. Along with its popular Auto Compress feature that gives you a trouble-free way of making larger worksheets print on a single page.

We've also added new features you won't find in other spreadsheets. Like the



With its WYSIWYG graphical environment, you can do all your formatting "live" on screen

Viewer (based on Lotus Magellan® technology) which helps you find the file you want before retrieving it. And a very helpful Auditor that simplifies the job of documenting and analyzing complex worksheet logic.

Of course, you won't just like what Release 2.3 does. You'll like how it feels.

It's quick and smooth. With a WYSIWYG (what-you-see-is-what-you-get) graphical environment that lets you format text, data, and graphics "live" on screen. Plus, what you see on screen is what you'll get when you print. With the mouse, you can execute commands, highlight cells or ranges, open dialog boxes, place and size graphs, change type styles, fonts and point sizes. All with unparalleled speed and ease.

What's

more, Release 2.3 gives you a wide range of printing and reporting capabilities. Including the capacity to place as many live graphs on a worksheet as you'd like.

Lotus 1-2-3 Release 2.3 runs smoothly and quickly no matter what hardware you're running it on.

Along with 96 type style combinations, new 3D-effect graphs, drawing and annotation tools, and the most font support, choices of colors and shading available.

Compatibility? As with any 1-2-3 product, it's no problem. Because Release 2.3 will read all of the files you've created on previous versions of 1-2-3, including files you've formatted using Allways™ and Impress™. So you'll preserve all your work, as well as your training.

For more information about the new Release 2.3 or for upgrade details, call us today at 1-800-TRADE-UP, ext. 1213.

What's New In Lotus 1-2-3 Release 2.3.

- A WYSIWYG graphical environment with live on-screen formatting
- Lotus Magellan viewer technology for fast file previewing, retrieving and linking...all without leaving your active worksheet
- More graph types, including 3D-effect graphs and graph annotation capabilities
- Auto Compress, for a trouble-free way of making larger worksheets print on single page
- Dialog Boxes for an easier, more interactive way of working
- Text-editing for easy on-sheet word processing, including automatic word wrap, even around graphs
- The Auditor for documenting or highlighting your spreadsheet logic
- Improved memory management for building larger worksheets up to 12 MB in size
- New printer drivers that support all leading laser and dot-matrix printers
- Context-sensitive Help and an interactive tutorial

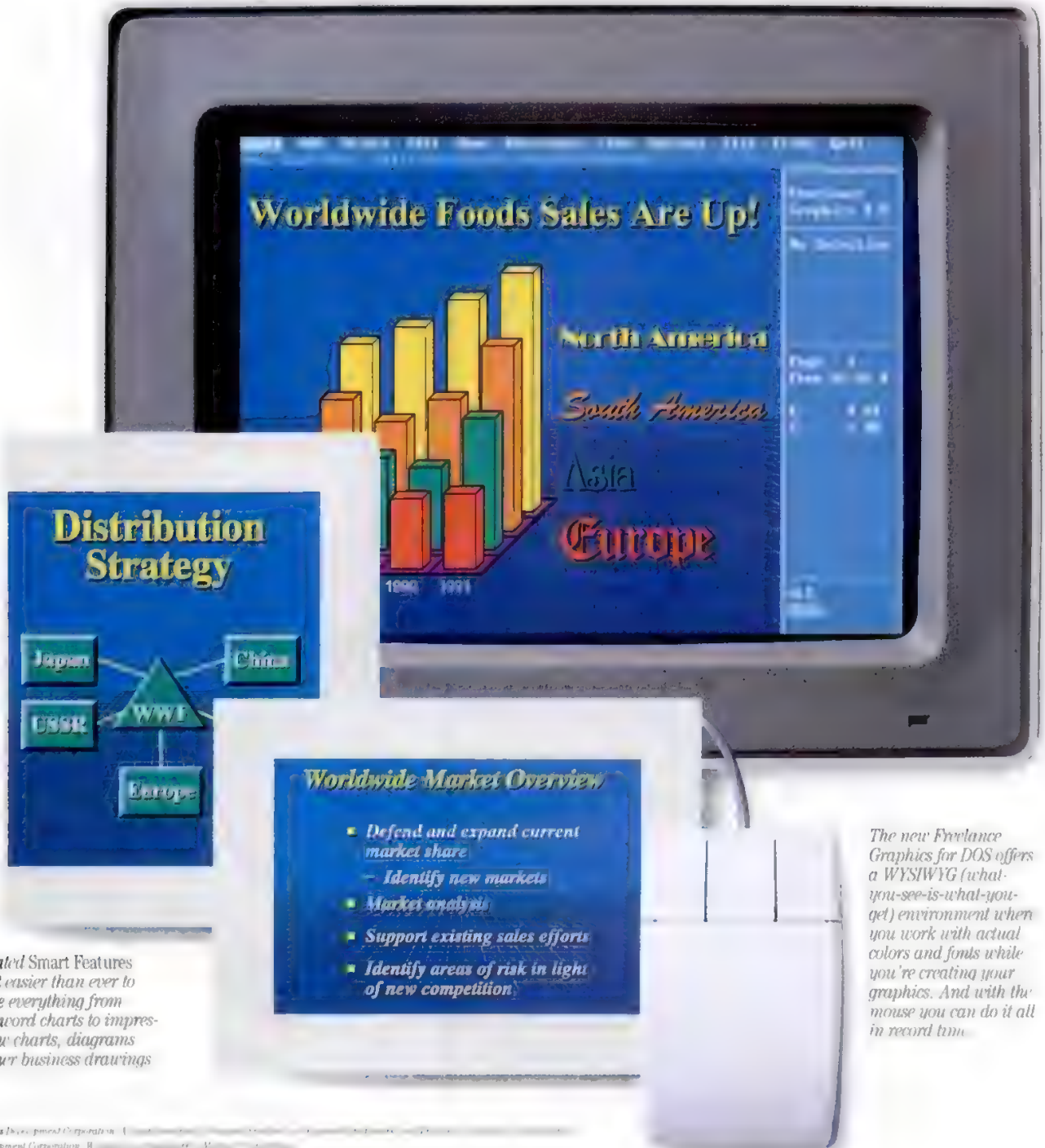


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The new Lotus 1-2-3 for DOS



Introducing the new It will create your next Not to mention



Automated Smart Features
make it easier than ever to
produce everything from
simple word charts to impres-
sive flow charts, diagrams
and other business drawings

The new Freelance
Graphics for DOS offers
a WYSIWYG (what-
you-see-is-what-you-
get) environment when
you work with actual
colors and fonts while
you're creating your
graphics. And with the
mouse you can do it all
in record time.

Freelance Graphics. presentation beautifully. automatically.

Now there's an even better version of Freelance® Plus, the award-winning graphics program praised by *PC Magazine*, *PC World* and *Software Digest*. It's so improved, in fact, we even changed its name. Introducing Freelance Graphics™ 4.0. The best presentation graphics program for DOS.

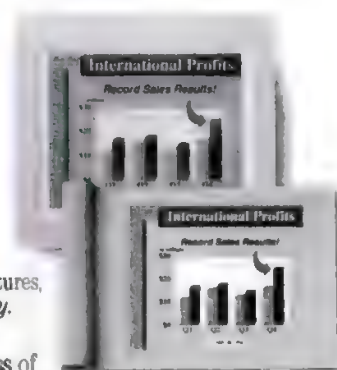
For starters, we've added a graphical WYSIWYG environment. Which means you'll work with actual colors and fonts while creating your graphics. Plus, you'll know what your output



For two consecutive years, Software Digest awarded Freelance Plus its highest-rating. Now with Freelance Graphics, we've made the best even better.



Only Freelance Graphics, with its unique automated Smart Features, can turn your rough ideas into a smooth presentation this easily.



will look like before you print.

And with the mouse you'll do it all—from executing menu commands to moving a chart—in record time.

Yet what's really unique about the new Freelance Graphics is its *Smart Features*. Unlike other DOS graphics programs, its hard-working *Smart Features* automate

the process of turning your ideas into persuasive presentations. So while you're concentrating on what you want to say, Freelance Graphics will take care of how it looks. Whether you're creating slides, overheads, or hard copy, in color or black-and-white.

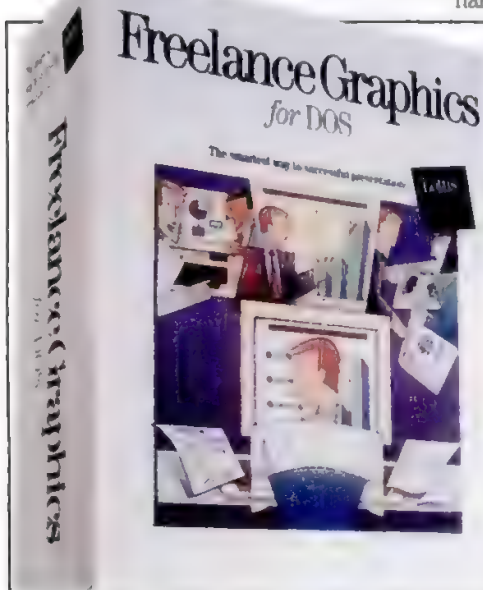
Here are a few of its *Smart Features*:

Portfolio, a built-in presentation manager, helps you organize and prepare your presentation; a **Text Chart Outliner** complete with a spell-checker, creates stacks of text charts in seconds; **Auto-charting** makes weekly or monthly reporting a snap by printing hundreds of up-to-date charts with a single command; **Smart Chart Update** automatically recomposes a chart whenever the data changes... even if you've added annotations or symbols; and over 1,000 **Pre-drawn Symbols and Design Backgrounds**.

All of which means you can now create an incredibly impressive presentation. With incredible speed and ease.

The new Freelance Graphics.

It could actually have you looking forward to your next presentation.



Upgrade to Freelance Graphics now and you won't just save time. You'll save money.

Right now we're offering—direct from Lotus®—a price of just \$99.00² for anyone upgrading from an earlier version of Lotus Freelance or Graphwriter, or any other eligible³ graphics program, including Harvard Graphics.

Plus, you'll be covered by the **Lotus Technology Guarantee**. Which means a guaranteed price of just \$49.00 on our upcoming Freelance Graphics for Windows™ product.

For information or to purchase your upgrade directly from Lotus, call us! Please have your credit card and eligible product package ready.

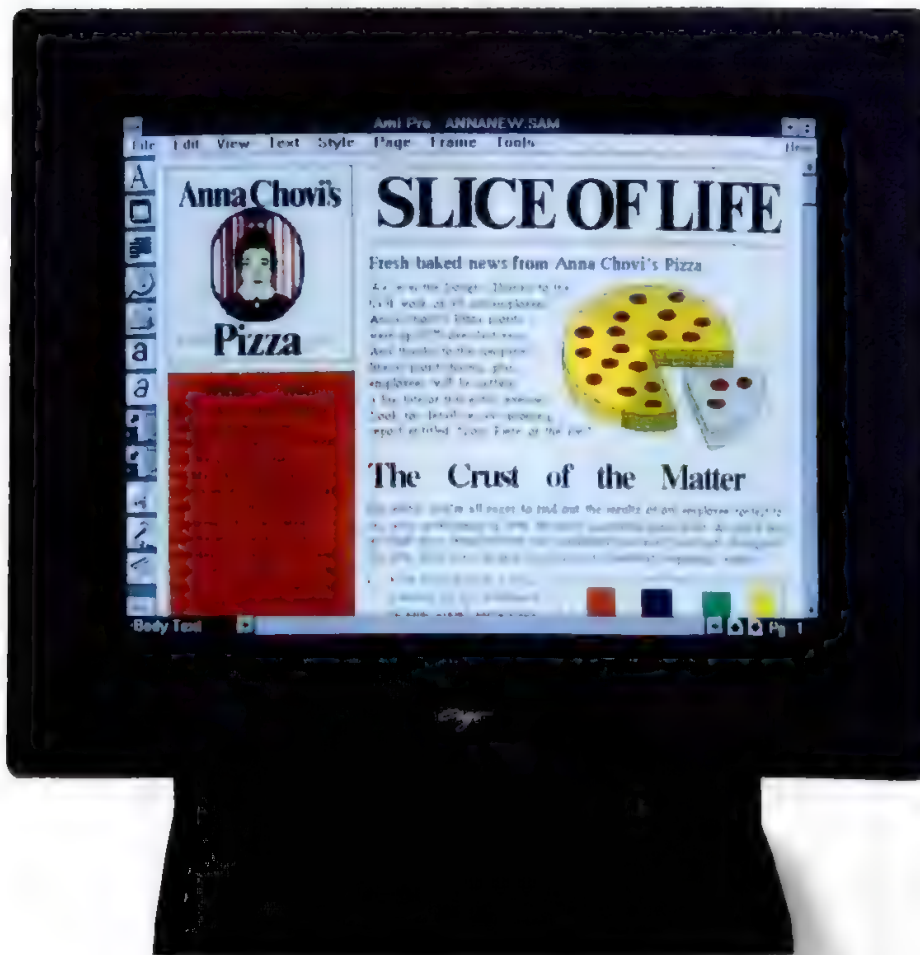
1-800-TRADE UP ext. 1097.

¹Developed by Symantec Corporation, especially for Freelance Graphics. ²Offer expires September 30, 1991, after which the Lotus direct upgrade price will be \$119. ³Eligible products for upgrade offer include all versions of the following products: Lotus Freelance Plus or Graphwriter, Harvard Graphics, DrawPerfect, Applause II/Draw Applause, Graph Plus, Charisma, Microsoft Chart, Plus, Gem Series, ChartMaster, Diagram Master. ⁴Freelance Graphics upgrade also available at participating Lotus resellers.

Freelance Graphics for DOS



Ami Pro lets you put the power of Windows into words.



Moving from a DOS to a Windows word processor is like trading in your bicycle for a Ferrari.[™] In fact, it's the only way to tap the enormous graphical power and ease of use that's built into Windows.

With Ami Pro, you get WYSIWYG and all the other graphic benefits of Windows. Plus features that give you incredible flexibility, like editing in full page view, dialog boxes with visual examples, tables...even "frames" that let you automatically wrap text around graphics. And Ami Pro is the only product that gives you built-in push button charting, graphing, drawing and image processing.

This unique visual approach to word processing allows you to replace obscure function key commands

with simple, logical screen selections, making it easy to access all of the powerful features of Ami Pro. And that lets you go beyond word processing to create documents that really *communicate*.

Take full advantage of Ami Pro for Windows by taking full advantage of this risk-free offer.

Call 1-800-831-9679

to upgrade to Ami Pro for Windows for \$129,* and if you don't think it's light years ahead of what you're using now, simply return it for a full refund. It's that easy to put the power of Windows into words—or call our toll free number for your free working model of Ami Pro from Lotus.^{*}

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Ami Pro for Windows

Lotus

Now that we've given you 3 great reasons to choose Lotus, here are 10 more.

1. The Language of Business.
Over 14 million people around the world know how to use Lotus products. So chances are, some of your friends and business associates use Lotus products and can help you if you need it.

2. Most Reliable.
Lotus products are renowned for their reliability. We invest more in quality than any other software vendor. At Lotus we release products only when their performance is up to your standards.

3. Most Compatible.
Sharing files, data and applications is incredibly important to our customers. Along with not having to be re-trained when a new version comes out. While other companies promise compatibility, no one but Lotus can deliver full file, macro, and even formatting compatibility.

4. Easiest-To-Use.
We've worked hard to consistently improve ease of use with each new version of Lotus software. And the hard work has paid off. When tested against competitors in independent research, customers have said that

our products are easier to learn and use than other products in their categories. It's that simple.

5. Outstanding Output.
We've designed our current products to deliver the highest quality output. With mouse support and an on-screen "What-You-See-Is-What-You-Get" formatting environment, Lotus products let you incorporate a wide array of fonts, hundreds of colors, images, graphs, even free-hand drawing.

6. Built-In Networking.
Every Lotus spreadsheet and graphics product is "network friendly," with a built-in ability to share files across a network. What's more, we've developed node and server versions of these products to help organizations better manage networking.

7. Technology Guarantee.
To help you exploit new technologies, we upgrade our products on an on-going basis. For just \$49, you can upgrade from any PC version of 1-2-3, Symphony, Freelance Graphics,™ or Ami Pro to any new version that comes out from Lotus within 6 months of your purchase. Which

means it's always a good time to buy from Lotus.

8. Thousands of Enhancement Products.
So popular are Lotus products that a whole industry has sprung up around them. Look through any PC magazine and you'll notice how many different software vendors are providing add-in products and templates specifically designed to enhance and support our products. And there are hundreds of training books and classes available as well.

9. Most Complete Platform Coverage.
Lotus spreadsheet products are available on and take full advantage of more platforms than any other software. This includes DOS, OS/2, UNIX, mainframes, workstations, laptops and palmtops.

10. Around the clock "live" support for spreadsheet users.
Unlike any other software company, only Lotus offers its spreadsheet users 24-hour support, 7 days a week, 52 weeks a year. Just call us directly and you'll get help right when you need it most.

Whether you work with numbers, words or graphics. Whether you work alone or with other software users in a workgroup. Lotus has a product that can help you work better. So choose Lotus. And be confident you're working with the best products money can buy.



The SF-9500 is the only BOSS product that accepts credit-card-sized RAM and ROM modules; the modules plug into a card drive located on the unit's right side and provide expanded storage for address, phone numbers, memos, and other BOSS data. A 64K RAM card costs \$129.95, and a 128K RAM has a list price of \$199.95. With no additional storage plugged in, the SF-9500 can store approximately 3,000 records distributed among its schedule, memo, business card, and phone directory applications. Like other organizers, the BOSS offers a clock that displays local time and time for a selected world city; alarms can be set to remind you of appointments or other important events.

LIMITED RECORD SIZE

Records are limited to 384 characters each, which is fine for the telephone and schedule functions but limits memo pad records to short notes and reminders. Fortunately, memo records can be linked. And since they are automatically maintained in correct sequential order, linking makes longer documents possible.

As is most often the case with machines this size, the SF-9500's QWERTY keyboard is too small to permit touch typing, but navigating around the key layout is made considerably easier by thoughtful color-coding. The alphabet keys are black, while number keys, cursor keys, and special keys such as shift, caps, and search are molded in a contrasting

COMPUTERS				
PALMTOP PCs				
Suitability to Task				
Casio SF-9500 Executive BOSS				
	1	2	3	4
Communications				
Note-taking				
Personal finance				
Scheduling				

gray. Function keys (in blue) and gold-colored application selection keys are placed in two rows along the bottom of the display.

The SF-9500's screen displays up to six 32-character lines. That's a somewhat smaller screenful than you get from machines like the Sharp Wizard or the Atari Portfolio, with their 40-character by 8-line screens. But the SF-9500's software has been carefully designed to make the best possible use of the limited display area available.

ADD-ONS

Add-on software for the SF-9500 comes in two forms. Several titles are delivered in ROM cards that plug into the BOSS's card drive. An electronic dictionary is available in several different versions, including one with a 42,000-word thesaurus (\$129.95) and another with financial and legal terms in addition to standard vocabulary (\$79.95). There is also an expense manager (\$129.95) that shares files

with Para-Tech Systems' *Expense Easy Plus* for desktop machines. A version of *Lucid 3D* (\$189.95) from PCSG was scheduled for release but not available at the time of this writing.

In addition to the ROM cards, Casio offers add-on software that lets you download useful or entertaining databases from your desktop PC to one or another of the BOSS's built-in applications. *Barron's Business & Travel Translator*, for instance, lets you bank useful foreign language phrases and translations on your PC, then download the customized database to the BOSS's business card file, where the information can be accessed just like any other collection of records. Among the five titles in this "Diskware" series (all are reasonably priced at \$22.95 each) are *Parker's Wine Companion* and *The OAG Travel Planner*.

All the Diskware titles require Casio's *PC-Link* hardware/software combination (\$129.95) to put your BOSS in touch with your desktop machine. The Diskware titles are installed under *PC-Link*, then accessed from its main menu. Once you've extracted a particular database from the Diskware application's master database, *PC-Link* takes over and manages the transfer to the BOSS.

Besides supporting the diskware applications, *PC-Link* serves as a data hub between the BOSS and a number of DOS applications. *PC-Link* translates data back and forth between Borland's *SideKick* and the Casio's telephone, business card file, schedule, and memo apps; the data can then be reconciled within *SideKick*. *PC-Link* also offers file-transfer compatibility with *PC-Tools* and can convert BOSS data to and from .SDF (standard delimited format) files for use in a variety of DOS applications.

Among the third-party software for the BOSS is a link to IBM's *Current*, a Windows-based PIM. The link, which exploits Windows's DDE facility, is available from Intellink of Acton, Massachusetts.

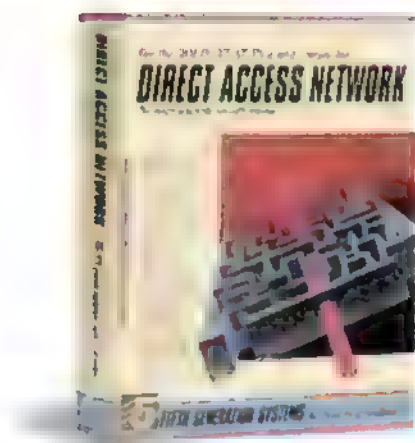
NO MODEM

The BOSS has one glaring limitation: Unlike all the other machines reviewed, it has no modem support, though Casio hints at future developments along those lines. This prevents it from being used for electronic mail, on-line information services, or fax. For many users the lack won't present a problem, but it does set the BOSS apart significantly from its competition.



The Casio BOSS is relatively inexpensive and very compact, though it lacks modem support. It's a good choice as an appointment book or note-taker.

A FREE SOFTWARE OFFER TO LAN MANAGERS FROM FIFTH GENERATION SYSTEMS



We're convinced Direct Access Network is the best network menu program in the category, so here's the deal. You send us your business card, we send you a full working copy to use free for 60 days. Once you try it, you won't want to manage without it.

But you're probably wondering how you can try out a menu program without taking forever to build the menus. Simple. Direct Access Network builds them for you—automatically. Whether you need to customize menus for individuals or groups, you can do it in minutes, not hours. Which will leave you plenty of time to explore the possibilities offered by six menu levels and their multi-level submenus.

From the old hand to the new kid who's all thumbs, all your users will appreciate the way Direct Access Network simplifies their jobs. With a single keystroke or mouse click, they can be in

their programs working. Instead of in your office asking questions. And online help means even fewer interruptions. In fact, users will like this new menu program so much, they just might think you got it for them.

Meanwhile, you'll be enjoying all the features designed to make your job easier. Like password protection. Usage tracking with bar graph reports. Software metering. A directory tree for customizing menus and submenus. A display of programs in use. Triple level virus detection. And more. You can even scan in the company logo and add some sizzle to all your startup screens.

To get Direct Access Network and use it free for 60 days, just send us your business card* by mail or fax to (504) 291-5453. We'll send you a copy of the program that will free you up to be a better manager.



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COMPUTERS

PALMTOP PCs

The BOSS doesn't have the Wizard's slick modem options or touch-screen capabilities; nor does it offer the DOS or near-DOS functionality of Atari's Portfolio or HP's 95LX. But it does a good job of handling the schedule, phone, and memo data that organizers were mainly created to deal with.

Its small size and relatively easy PC integration via *PC-Link* have made the BOSS an indispensable companion for many PC users on the go.

HEWLETT-PACKARD CO. HP 95LX Palmtop PC

by Jonathan Matzkin

Good things *do* come in small packages—and, as Hewlett-Packard's 95LX Palmtop PC demonstrates, the packages just keep shrinking. The 1- by 6.3- by 3.3-inch 95LX literally puts DOS 3.22 into the

palm of your hand. And unlike some of the larger palmtops considered here, the 95LX slides easily into most pants or jacket pockets. It even fits (more or less) into a shirt pocket.

HP's tiny wonder differs from other palmtops in other significant ways. Its built-in software, which includes a special version of *1-2-3*, Release 2.2, is head and shoulders above the competition in terms of sophistication, PC compatibility, and overall usefulness. With 512K of



PALMTOP PCs: SUMMARY OF FEATURES

Products listed in alphabetical order

	Atari Portfolio	Casio SF-9500 Executive BOSS	HP 95LX Palmtop PC	The Poqet PC	Palm Organiser II LZ-64	Sharp Wizard OZ-8200
List price	\$299	\$320	\$699	\$1,450	\$420	\$320
PHYSICAL CHARACTERISTICS						
Dimensions (HWD, in inches)	0.6 x 7.8 x 4	0.8 x 5.6 x 3.3	1 x 6.3 x 3.3	1 x 8.8 x 4.3	1.1 x 5.6 x 3.1	0.8 x 7 x 3.8
Weight	16 oz.	9 oz.	11 oz.	19 oz.	9 oz.	10 oz.
Screen:						
Dimensions (H x W, in inches)	1.8 x 4.5	1.3 x 4	1.8 x 4.5	2.9 x 6	1 x 2.5	2 x 2.5
Capacity (lines by characters)	8 x 40	6 x 32	16 x 40	25 x 40	4 x 20	8 x 40
Adjustable contrast	■	■	■	■	■	□
Number of keys on keyboard	63	92	80	77	36	80
Storage and memory:						
Maximum RAM capacity	512K	64K	512K	512K	64K	64K
Maximum internal storage	512K	64K	330K	512K	62K	N/A
External storage media	RAM card	RAM card	RAM card	RAM/ROM cards	Datapaks	RAM card
I/O ports:						
Parallel	\$79	Included	Included	\$99	\$100	Included
Serial	\$49	Included	Included	Included	Included	Included
File transfer software	None	<i>PC-Link</i> (\$130)	HP connectivity kit (\$100)	<i>PoqetLink</i> (built-in)	Comm link (\$100)	<i>Organizer Link</i> (\$130)
Wireless file transfer	□	□	■	□	□	□
Power:						
Number and type of batteries	Three AA	Three lithium	Two AA	Two AA	One 9-volt	Four lithium
Backup battery	■	■	■	□	□	■
FUNCTIONS						
Spreadsheets	Subset of Lotus 1-2-3	<i>Lucid 3D</i> (\$190)	<i>Lotus 1-2-3</i> 2.2	<i>Lotus 1-2-3</i> 2.1	<i>Pocket Spreadsheet</i> (\$100)	<i>Lucid 3D</i> (\$180)
Maximum size (rows by columns)	255 x 127	999 x 26	8,192 x 256	Unlimited	99 x 26	999 x 26
1-2-3-compatible	■	■	■	■	■	■
Outputs ASCII and database text	■	□	■	■	■	■
Text editor:						
Outputs ASCII file	■	□	■	■	■	□
Automatic word wrap	■	□	■	■	□	□
Direct output to printer	■	■	■	■	■	■
Communications:						
Modem package	Public-domain software only	None	Built-in	WorldPort 2400 (\$345)	Snap-on modem (\$200)	Fax/Modem (\$499), modem only (\$180)
Modem speed	N/A	N/A	2,400 bps	2,400 bps	1,200 bps	300 bps
Auto-dialer	■	N/A	□	■	Optional (\$80)	□
Personal information management:						
Address book	■	■	■	■	■	■
Can be merged with text file	■	■	■	■	■	□
Memo capacity (characters)	Unlimited	384	Unlimited	Unlimited	Unlimited	2,048
Maximum number of alarms	17	1 per event	1 per event	1 per event	8	1 per event
Prioritized to-do list	■	□	■	□	□	■
Password protection	□	■	■	□	■	■
Built-in programming language	□	□	□	□	■	□

■—Editors' Choice

■—Yes

□—No

N/A—Not applicable: The product does not have this feature.

Suddenly, Obsolescence Is Obsolete!

Now! Northgate Brings You The Only Affordable Upgrade Concept — Scalable Processing Architecture (SPA)!



How many computers do you see here? Three? Guess again.

These platforms represent FIFTEEN new high-performance Northgate SPA systems! Every one of these systems is field upgradable to faster processing speeds by simply replacing one power module. It's easy — you can even do it yourself!

Northgate brings you this technology for a fraction of the price others charge for upgrades. Skeptical? Look!



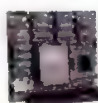
Suppose you started out with a 386/25 MHz system. This module delivers that power and performance in your choice of SlimLine™, Elegance™ Desktop or Elegance Vertical Power Platforms. Want to Upgrade in the future? We'll buy your 25 MHz module back and send you the more powerful upgrade module. Every power module has 64K RAM cache included ... all for an unbeatable price!



Upgrade to 386/33:
send us your 386/25
module and ONLY **\$349⁰⁰**



Upgrade to 386/40:
send us your 386/25
module and ONLY **\$649⁰⁰**

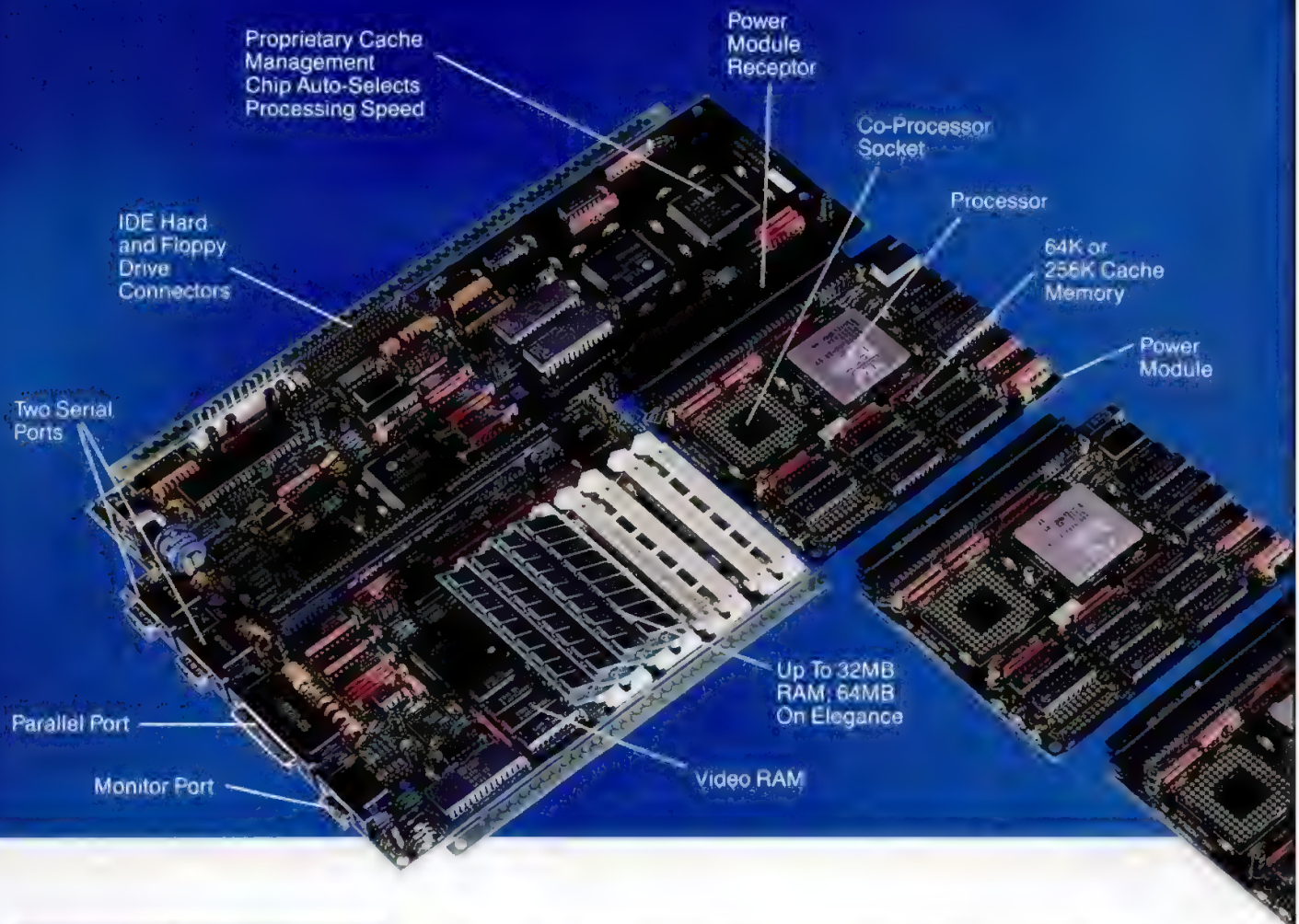


Upgrade to 486SX/20:
send us your 386/25
module and ONLY **\$749⁰⁰**



Upgrade to 486/33:
send us your 386/33
module and ONLY **\$999⁰⁰**

Now! Northgate Smashes The Upgrade Cost Barrier!



Here's How Scalable Processing Architecture (SPA™) Works!

The challenge facing our R&D department was: Create a total system concept that makes on-site upgrading fast and affordable while maintaining award-winning Northgate performance.

Northgate did it! Our engineers designed the SPA Main System Board (see photo) with a slot where one of five power modules — including cache and coprocessor socket — easily plugs in. 64K cache standard (256K optional).

A proprietary Cache Management Chip on the Main System Board senses what processor is on the module and automatically lets all the other parts know who's in control. Plug in the power module, "fire it up" and thrill to the new performance. Incredible? You bet it is! Your data remains intact.

Never before has the computer world been presented with the options, flexibility and economies of Scalable Processing Architecture. It's a Northgate original, developed to meet the wants and needs of computer users like you.

SPA eliminates your future equipment concerns. And secures the value of your investment. Want to equip your department with lower cost 386 systems with an eye toward moving into 486 processing in a year or so? SPA is your only low cost, high performance answer.

Three Platforms, five Power Modules ... fifteen systems in all! Northgate has an SPA system to meet every application. Start by selecting the platform you need. Space-saving SlimLine, full size

Elegance Desktop, or for use as a file server choose the Elegance Vertical Power platform. All three accept any of the five power modules: 386/25, 33, 40, 486SX/20 and 486/33 MHz.

100% field upgradable ... dollars back, too! Some others make you send your system back for upgrading. What a time waster! Northgate SPA systems can be upgraded right in your office or home. You can even do it yourself with just a screwdriver (detailed instructions provided). Want a coach? Call Northgate Tech Support any time day or night. (We're here 24 hours a day, 7 days a week.) One of our experts will guide you through it. Phone call and service are free! *And anytime you upgrade, we'll pay you real dollars for your old module!*

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- Microsoft® Windows™ and mouse
- FCC Class B certified

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- *OmniKey* keyboard
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- QA Plus Diagnostic and utility software
- Microsoft® Windows™ and mouse
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CIRCLE 207 ON READER SERVICE CARD

CODE A03

COMPUTERS PALMTOP PCs



Hewlett-Packard's HP 95LX represents a new generation of DOS palmtops: compact and loaded with features, with Lotus 1-2-3 built right in.

RAM included in its base price of \$699, the 95LX also comes with far more memory than Sharp's Wizard, Casio's BOSS, or Atari's Portfolio. The 95LX gets its smarts from an 8088-compatible NEC V20H processor.

POQET COMPARISONS, POCKET PRICE

It's tempting, if not exactly fair, to compare the 95LX to the somewhat larger Poqet PC, which is still alone among palmtops in providing true PC compatibility. The 95LX lacks The Poqet's fine 80-column by 25-line display, instead offering a 16-line by 40-column screen. The small screen is more reminiscent of the ones found on non-DOS palmtops than The Poqet's, but it has good contrast and is quite readable.

The 95LX's keyboard is simply too small to permit touch-typing—another difference from The Poqet. While you'll need some practice on The Poqet to gain fluency, touch-typing is possible for most typists. In contrast, a two-fingered approach is necessary for the 95LX. But since the keyboard is laid out in QWERTY format, you can attain a reasonable typing speed once your two favorite digits become oriented.

The unfairness of the comparison between the 95LX and The Poqet PC resides mostly in the relative costs of the two machines. While the 95LX may not be

quite as elegant, high tech, or functional as The Poqet, it also sells for hundreds of dollars less. The HP has power to spare for those tasks that you would normally do on a palmtop, and its eye-catching price adds to its attractiveness.

Like most other palmtop manufacturers, HP opted for storage in the form of credit-card-sized RAM and ROM units that it makes available in 128K (\$200) and 512K (\$400) densities. Smaller cards available from third parties can be used with the 95LX as long as they meet standards set by the PC Memory Card International Association and the Japan Electronic Industry Development Association. A card slot on the left side of the 95LX's case can be addressed as an A: drive.

LOTUS LIMITS

Users who spend a lot of time in the field will be most concerned with the 95LX's 1-2-3 functionality. The built-in version of Release 2.2 lacks *Allways* functions and also leaves out the Macro Manager Library, PrintGraph, and Translate functions. Add-ins must support the 95LX's small, character-based MDA display and must be able to run in conventional memory. Some macros will have to be modified to take the 95LX's small screen into account. The 95LX version of 1-2-3 also lacks support for EMS.

On the other hand, the 95LX contains

some improvements over the desktop version of 1-2-3. The 95LX's clipboard lets you move data between 1-2-3 and other built-in applications like the memo pad and the appointment book (the clipboard exchanges data among the other apps also). And the 95LX's calculator, which is similar in features to HP's 19B calculator, lends smoothly integrated backsolving capability to 1-2-3.

Perhaps the biggest limitation of 1-2-3 as it runs on the 95LX is the amount of memory available for worksheets. As shipped, about half of the 95LX's 512K of user RAM is reserved for a RAM disk, which is addressed as C: and forms the 95LX's only internal storage. 1-2-3 reserves about 85K of RAM for buffers, variables, and other housekeeping, and the 95LX reserves a small amount of RAM for its own internal purposes. That leaves about 109K for worksheets. Sliding an optional 512K RAM card into the 95LX's card drive lets you shrink the internal RAM disk to a minimum size of 30K, leaving about 330K available for sheets.

That won't seem like much to number crunchers who regularly build huge worksheets, but 109K is more than enough space in which to do meaningful work. Because the software was developed by Lotus, it reads and writes in native 1-2-3 format. Communication with desktop machines running Lotus is as simple as connecting HP's proprietary cable and zinging files back and forth. The cable is sold as part of a connectivity package (\$99.95) that also includes a file-transfer package for the desktop machine. The file-transfer software was not available



FACT FILE

EDITORS' CHOICE

HP 95LX Palmtop PC

Hewlett-Packard Co., Inquiries Manager, 1000 NE Circle Blvd., Corvallis, OR 97330; 800-443-1254.

List Price: With 512K RAM, \$699.

Options: 128K RAM card, \$200; 512K RAM card, \$400; desktop PC connectivity kit, \$100.

In Short: The smallest DOS-based PC yet, HP's 95LX is clearly the class of the palmtop field. With 1-2-3 built in, it offers considerable power in an almost unbelievably small case. The other applications work well, and the machine's only real drawback is that its diminutive dimensions make touch typing just about impossible.

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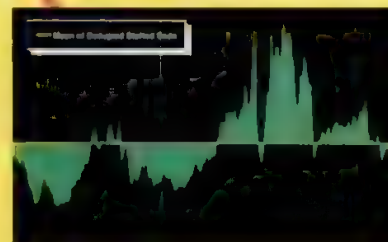
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COMPUTERS

PALMTOP PCs

for evaluation at the time of this writing.

Besides links to 1-2-3, conversions for Borland's *SideKick*, Lotus's *Metro*, and Central Point Software's *PC Tools* will also be available. Traveling Software's DOS-Connect will even let your desktop PC recognize the 95LX as a disk drive.

One of the HP 95LX's most innovative

Suitability to Task

HP 95LX Palmtop PC

	1	2	3	4
Communications	☐	☐	☐	☐
Note-taking	☐	☐	☐	☐
Personal finance	☐	☐	☐	☐
Scheduling	☐	☐	☐	☐

features is an infrared port that allows data exchange without cables between two of the units. The port's uses may be limited today, but if HP or a third party develops compatible IR ports for desktop PCs and printers, the 95LX will render cumbersome file transfer procedures obsolete.

INTEGRATED APPS

When you turn on the 95LX by tapping its On key, you find yourself inside a shell that knits together its internal applications. Those applications execute in 1MB of ROM located at addresses above DOS's 640K RAM barrier. The built-in code has an 18K footprint in conventional DOS memory. Data is read into RAM as usual under DOS.

You can select 1-2-3, along with any of the 95LX's other built-in functions (file manager, communications, phone list, memo pad, and calculator), by tapping a key labeled with the application's name. These keys also let you context-switch from within one application to another without having to close your current file. Certain aspects of the Lotus interface are consistent throughout the built-in applications: All of them have familiar, two-line menu structures, for instance, and top-level menus are popped up with a tap of the slash, or "menu" key.

There are limits to the file sizes that can be loaded into the 95LX's built-in memo (51K), phone (47K) and appointment book (43K) applications. Although that's plenty of room for most of the work that any sane person would think of doing on a machine of this size, it would have been more elegant to support file sizes up to available memory. The comm application proved just fine for logging on to MCI Mail and CompuServe, though it was necessary to

adjust account parameters to accommodate the 95LX's small screen.

Standard off-the-shelf DOS software will run on the 95LX as long as it can cope with the limits imposed by the screen, the palmtop's monochrome display adapter, and available RAM. The DOS prompt is accessed by choosing "System" from the file manager's menu. CHKDSK reported roughly 172K RAM available with the RAM disk sized to 254K.

Several DOS software publishers have also announced custom versions of their products, to be delivered on ROM cards, for the 95LX. These applications will include Palmtree Products' *Express* for MCI Mail, Contact Software International's *ACT!* contact management software, and MECA Software's *Managing Your Money*.

For easy file exchange, Palmtree will also offer a card drive that reads, writes, and executes files from standard RAM cards. At \$350, though, it's an expensive option.

The HP 95LX is a remarkable engineering feat and represents an impressive collaboration between Hewlett-Packard and Lotus Development Corp. Its many DOS-friendly features and powerful built-in software make it a natural for PC users who seek a pocket-sized partner for their larger systems. This palmtop is not as

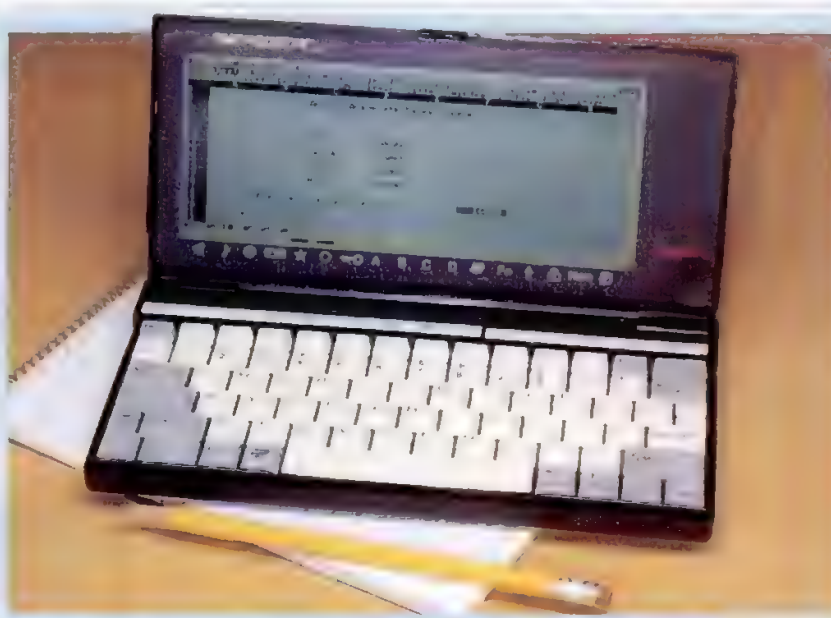
powerful or versatile as The Poquet PC (which will be introduced in a 640K version early this summer), but its very reasonable price makes the HP 95LX almost irresistible.

POQUET COMPUTER CORP. The Poquet PC

by Tom Unger

While the other miniature PCs in this roundup limit themselves to proprietary applications or scaled-down versions of spreadsheets, word processors, and other software, The Poquet PC smashes the myth that "if it weighs less than 4 pounds, it isn't a real computer."

This 1-pound DOS PC, with 512K of static RAM and 640K of ROM, was revolutionary when it was first introduced two years ago, and it remains so today. Improvements to its display and, most important, to its diminutive keyboard make it something of an anomaly in a field where full-power portable DOS computing still means a sore shoulder or an extra carrying bag. And while its \$1,450 list price is currently the highest for a palmtop PC, with a bit of shopping around you can find The Poquet discounted for less than \$1,000. It then becomes competitive with many low-powered 8088 notebook computers.

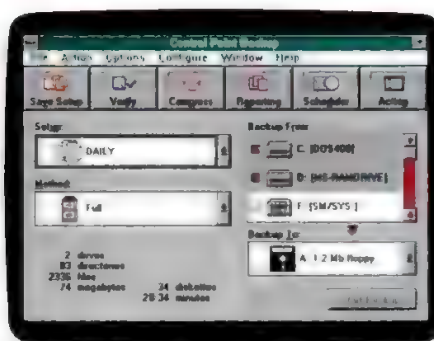


Though it may not fit in your pocket, The Poquet PC has the best screen and most workable keyboard of these palmtops. With an 80C88 processor, this is a true DOS computer.

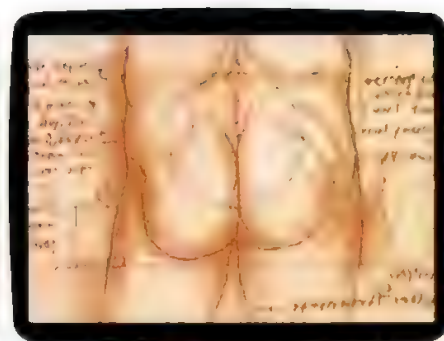
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FACT FILE

The Poquet PC

Poquet Computer Corp., 650 N. Mary Ave., Sunnyvale, CA 94086; 408-982-9500.

List Price: \$1,450.

Options: 512K RAM card, \$350; 1MB RAM card, \$700; 4MB RAM card, \$1,400; floppy disk drive, \$495; parallel port cable, \$100; serial/modem cable, \$60; WorldPort 2400-bps modem, \$345.

In Short: The Poquet PC trades the true palmtop form factor for better usability: The keyboard makes touch typing easy, and the 80-by-25 screen is clear and readable. But the price is high—even considering that Poquet bundles Lotus 1-2-3 with each unit. This 80C88-based computer still won't fit in your pocket, but it will leave plenty of space in your briefcase.

CIRCLE 648 ON READER SERVICE CARD

POWER MANAGEMENT

If you're tired of carrying 2 or 3 pounds' worth of extra batteries on your cross-country airplane trips, you'll be glad to find that the 1-by-8.8-by-4.3-inch (HWD) Poquet runs on just two AA alkalines—for up to 100 hours, according to Poquet. With such a long duration, this system may make you forget about batteries altogether. Still, the ability to purchase new ones nearly anywhere lends the PC an aspect of

convenience not found in other DOS-based portables.

Designed to save power, The Poquet's screen lacks power-hungry backlighting. Other highly aggressive power-management techniques also help keep the system running on its two tiny batteries. For example, the 80C88 processor powers down if you stop working for any length of time and shuts down between keystrokes as well. Rather than requiring you to reboot each time you want to use the computer, The Poquet PC's keyboard-mounted on/off switch returns you instantly to the application in which you were working when you last shut down. The convenience of this feature is especially evident during travel, where frequent shutdowns are inevitable. The Poquet also shuts down automatically after 4 minutes of idle time.

ON BOARD, ON CARD

Most users won't find The Poquet PC's 512K RAM limit a problem because The Poquet also includes a 640K ROM disk loaded with MS-DOS 3.31 and six Poquet utilities: a scheduler (with alarm), a simple word processing program for notes and memos, a four-function memory calculator, a phone-and-address database, a

modem communications package (Poquet's version of TouchBase Systems' WorldPort 2400 costs \$345, though any Hayes-compatible modem will do), and *Poquet-Link*, a DOS-compatible file-transfer and file-management program that lets you share files with your desktop or another laptop.

Poquet includes a proprietary *Poquet-Link* cable whose connector plugs into the single slot in the machine's back. Also available are serial/modem and parallel

Suitability to Task

The Poquet PC

	1	2	3	4
Communications	☐	☐	☐	☐
Note-taking	☐	☐	☐	☐
Personal finance	☐	☐	☐	☐
Scheduling	☐	☐	☐	☐

cables for \$60 and \$100, respectively. Poquet has lived up to its promise of supplying floppy disk support: For an additional \$495, you can purchase an external floppy disk drive.

CHOICE PROGRAMS

The *PoquetWrite* word processor produces ASCII output, which should make it compatible with your word processor. Unless you're doing very simple note-taking, though, you should probably work in your usual word processing program. Because The Poquet PC has two slots for credit-card-sized ROM and RAM modules, you can transfer your favorite programs to RAM cards. A 64K card comes with The Poquet, and you can buy 512K and 1MB cards for \$350 and \$700, respectively. These prices need to come down significantly if Poquet expects to sell the cards in quantity, however—especially considering that the cost of a standard 1.44MB floppy disk is less than three-hundredths the cost of a 1MB RAM card.

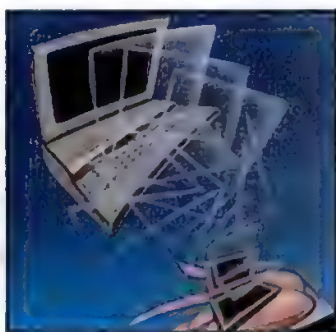
Poquet has made a number of popular programs available—at standard prices—on ROM cards, including *XyWrite III Plus* (\$495), *Lotus 1-2-3* (\$495), *Lotus Agenda* (\$395), *Lotus Works* (\$245), and *Contact Software International's ACT!* contact management software (\$395). One drawback to using ROM-based software is that all setup and configuration files must be stored on a memory card or in a RAM disk; they can't be changed on the program card. None of the ROM-based software cards sent to us could be write-enabled.

COUNTERPOINT

by Bill Machrone

Hewlett-Packard's 95LX is a distinctly American product. Unlike the Japanese organizers, the 95LX embodies a trio of standards: DOS, 1-2-3, and the venerable HP calculator. From this starting point, its designers set about making it pocket-sized and functional.

The Sharp Wizard, Casio BOSS, et al., seem to have started with a form factor, then added functions. They've grown up from card-sized phone dialers, while the 95LX has grown down from a laptop computer. Having 1-2-3 in ROM is a quant jock's dream. The dedicated ten-key pad is a necessity for any serious number work.



The 95LX is by no means perfect, though: The Wizard palmtop features better ergonomics. You can actually type on Sharp's QWERTY keyboard, and its gentle contours are more likely to find a home in your pocket than the hard-edged 95LX, which you'll

probably relegate to your briefcase. But the Wizard's keyboard ergonomics aren't worth much without a serious screen, and that little Post-it screen isn't serious enough for me.

Given the choice between a palmtop computer with organizer capabilities and a pocket organizer with some computing capabilities, I'll take the computer. ■

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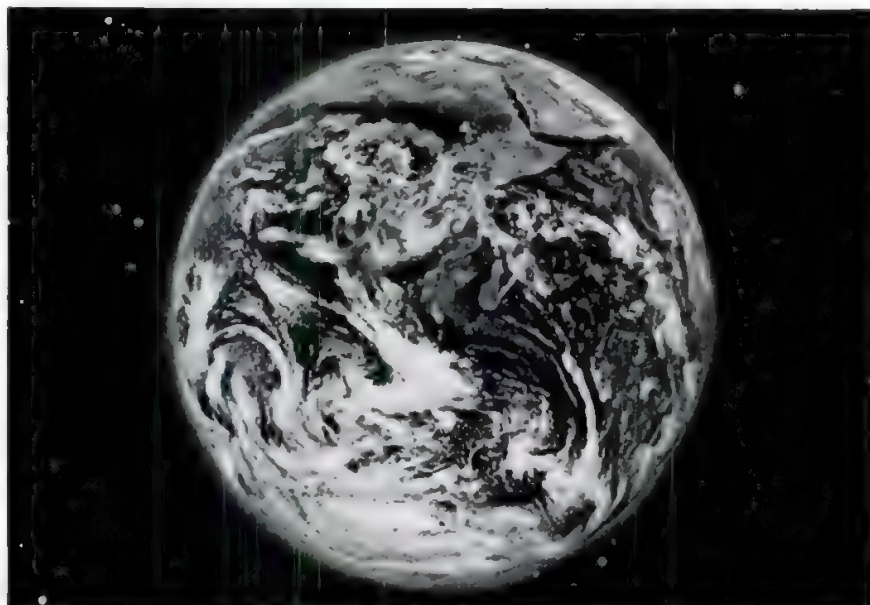
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COMPUTERS PALMTOP PCs

FIT, FINISH, AND FINGERS

When we first reviewed The Poqet, it suffered from numerous fit and finish problems. Most notably, it had an overly stiff keyboard whose keys tended to wobble on their posts. Poqet has worked hard to improve that 77-key QWERTY keyboard; within the confines of this small form factor, the company's engineers have succeeded. They eliminated the wiggle entirely, but there's still room for improvement: The keys remain a bit stiff, and the 10 dedicated and 2 shiftable function keys are truly tiny. If your fingers are wide, you'll need to type slowly to achieve any level of accuracy.

Though the keyboard takes some getting used to, The Poqet PC's CGA-compatible screen doesn't. It supports 80 characters by 25 lines at a 640-by-200 pixel resolution. The text font is small, but the letters are crisp and readable against the reflective screen background. Surprisingly, the screen seems to be most readable in medium- to low-light situations, such as those found in an airplane. The harsh glare of an overhead fluorescent fixture can make the screen nearly unreadable. The display (which, like in a clamshell, forms the case's lid), rotates 180 degrees to help you find the best viewing angle.

SEND IT BACK

Poqet offers a one-year parts-and-labor warranty, standard. If you need service during that year, you'll have to ship your Poqet PC back to the manufacturer. Poqet does have a support line open Monday through Friday from 7 A.M. to 7 P.M. P.S.T., but it's your nickel. Poqet also offers a VIP Service plan, though it's no bargain. For \$120 during the first year of ownership, Poqet will replace your Poqet PC within 24 hours. The company also offers its VIP customers toll-free support seven days a week. You can extend the VIP service past the first year of ownership for an additional \$395 per year. All this seems expensive—especially since full-fledged PC manufacturers offer many of these services free.

When The Poqet PC debuted two years ago, only the NEC UltraLite could fit into a briefcase and still leave room for a folder or two. Now that 80286- and 80386SX-based notebook computers are widely available, your choice depends heavily on the kind of work you do when traveling.

If you need VGA graphics or megabytes of storage, The Poqet PC may not

handle your tasks with ease. But if most of your road work consists of writing short memos, sending electronic mail, and working on small- to medium-sized spreadsheets, you'd be hard put to find a more capable unit than the Poqet PC.

PSION INC.

Psion Organiser II LZ-64

by Jonathan Matzkin

The Psion Organiser was the earliest of the pocket computer/organizers to appear, and Psion has aggressively upgraded the Organiser in a variety of ways since its introduction. The Organiser's internal RAM has been steadily expanded, and add-on storage modules have appeared in larger capacities. We reviewed the cur-

Suitability to Task

Psion Organiser II LZ-64

	1	2	3	4
Communications	☒	☒	☒	☒
Note-taking	☒	☒	☒	☒
Personal finance	☒	☒	☒	☒
Scheduling	☒	☒	☒	☒

rent top-of-the-line model, the \$420 Organiser II LZ-64, which has 64K of internal RAM and accepts add-on storage cartridges in densities up to 256K.

The Organiser's well-designed menu-based internal software has grown considerably in functionality and usefulness over the course of several revisions. An impressive catalog of software and hardware accessories now graces the Organiser as well. There is a snap-on, Hayes-compatible, 1,200-bps modem (\$199.99), as well as other peripherals such as a bar code reader (\$249.99) and a magnetic card reader (\$299.99), both of which are suitable for vertical and OEM applications

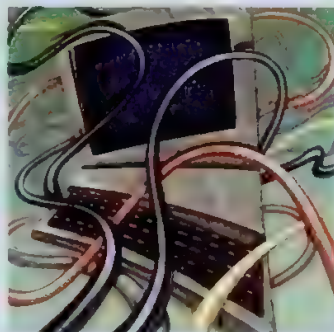
COUNTERPOINT

by Joel Dreyfuss

If you're going to do a lot of typing on a business trip, a 7- or 8-pound notebook PC may be an unavoidable traveling companion. But on a short trip, when you need only a list of phone numbers, reminders, and appointments, a palmtop computer is just fine. If only you could get your data in and out with ease.

The Poqet PC and the HP 95LX let you communicate with your PC in the most straightforward fashion: They just require a serial cable and programs like Traveling Software's *LapLink*, plus compatible PIM programs such as Central Point Software's *PC Tools*.

Shuttling data between a PC and non-DOS palmtops like Casio's BOSS and the Sharp Wizard is a lot trickier. The software available is often less than helpful. With Borland's Wizard-compatible version of *SideKick* 2.0, for instance, reconciling two differing schedules can be painfully slow. You have to examine each appointment and



decide whether to delete or replace it.

For those few who actually fathom *Lotus Agenda*, Eye-on Associates has developed a link for the BOSS and the Wizard, for use with *Agenda*—but the categories are tricky. The names and phone numbers from my

Wizard would not move into the *Agenda* address book category on my home PC. Traveling Software offers more choices for the BOSS: You can transfer to and from *PC Tools*, *Classic SideKick*, and *SideKick Plus*, but not *SideKick* 2.0. All these programs warn that you must be disciplined about entering your data into rigid, preset structures on your PC—or their systems will choke during the transfer. That just won't do.

To make palmtop PCs really useful, what we need are robust links to *PC Tools*, *WordPerfect Office*, IBM's *Current*, and Chronologic's *Instant Recall*—and software that is smart enough to parse data and put it in the appropriate category. ■

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CIRCLE 286 ON READER SERVICE CARD

such as data acquisition and inventory control.

MINIMAL DISPLAYS, NO QWERTY

For all those improvements, however, the Organiser has lagged behind in two crucial areas: its display and its keyboard. In fact, the Organiser's 1.1- by 3- by 5.6-inch (HWD) case has changed little since its introduction, and the 9-volt battery-operated unit bears a strong resemblance to a conventional calculator. The two least expensive members of the Organiser line (the 8K RAM Organiser II CM, which sells for \$209.99, and the 32K RAM Organiser II XP, which has a list price of \$282.49) have tiny 2-line by 16-character displays.

Two more-expensive models, the 32K RAM Organiser II LZ (\$314.99) and the top-of-the-line, 64K RAM Organiser II LZ-64 (\$419.99) feature slightly larger displays. These displays, however, still show only four 20-character lines at a time—far less than competing palmtops do. The displays do scroll, one line at a time, to show a full 80-character line, but reading a line that way quickly grows frustrating.

Even more difficult is attempting to type on the Organiser's alphabetically organized keyboard, which severely limits its appeal for general users. Nearly all palmtops now have QWERTY keyboards; even the most cramped QWERTY layout is better than ABC organization for any sort of text entry.

SUPERIOR MENU SYSTEM

Despite the antiquated keyboard, an ingenious, menu-driven software structure



FACT FILE

Psion Organiser II LZ-64

Psion Inc., 118 Echo Lake Rd., Watertown, CT 06795; 203-274-7521.

List Price: With 64K RAM, \$420.

Options: 32K Rampak, \$105; 128K Rampak, \$263; 256K Rampak, \$368; 16K Datapak, \$45; 32K Datapak, \$65; 128K Datapak, \$200. Datapak formatter, \$150; comm link to PC, \$100; bar code reader, \$250; magnetic card reader, \$300; direct connect modem, \$200

In Short: An alphabetically oriented keyboard and small screen make the Psion Organiser II difficult to recommend to typical palmtop users who seek an all-purpose machine. But its built-in programming language and optional data acquisition peripherals make the Organiser the choice for many OEM and vertical applications such as inventory control.

CIRCLE 650 ON READER SERVICE CARD

COMPUTERS PALMTOP PCs

The Psion Organiser
lags behind in two
crucial areas: its
display and keyboard.

allows easy selection of built-in options. The LZ-64's operating system and built-in applications are contained in 64K of ROM (above and beyond the 64K of available RAM).

When you tap the LZ-64's On key, the first thing you see is a menu of applications and utilities. From then on, navigation is simple. For example, moving the cursor to Save and tapping Exe, the Organiser's equivalent of Enter, causes the LZ-64 to prompt for text to save. To retrieve any saved text, choose Find from the main menu and enter a search string. The Organiser initially keeps all saved

text in a central file; you can, however, create separate files by using the Xfiles menu option.

This ultra-easy-to-use text base is great for saving quick notes or simple database records, but the always frustrating keyboard makes text entry a chore. Another facility keeps track of appointments: You can enter an appointment by choosing either Diary or Month (to invoke a calendar display) from the main menu. A hardware/software combination, available separately for \$99.99, lets you share appointment files with your desktop machine. Notes, another main menu choice, accesses a notepad.

The main menu also gives access to a local and world clock, user-configurable alarms, and an extremely sophisticated calculator. The calculator is particularly powerful because its command line accepts any of the numeric functions designed for the Organiser's built-in programming language, OPL.

Other pocket organisers like the Sharp Wizard and the Atari Portfolio may support programming languages, but none of them offer a structured, procedural language like OPL as standard equipment.

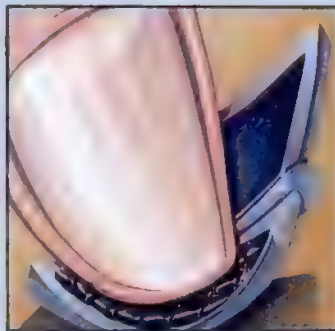
COUNTERPOINT

by Bill Howard

This is what it feels like to use a palmtop as a computer. As an expensive calculator, electronic datebook, or memo-taker, it's fine; as a laptop replacement, no way. Palmtops as PCs represent too many compromises. The manufacturers need to make it easier to transfer data to the mother ship. And if palmtops are easy to use, why are the manuals bigger than the products?

As a PC workalong, the Psion Organiser is the least capable (smallest screen, no QWERTY keyboard). The Sharp Wizard and Casio BOSS are okay as low-level organizers; take the Sharp for its somewhat greater sophistication and ability to add a modem. The Atari Portfolio is too big for your pocket and it's not—no matter how Atari describes it—a DOS PC.

The HP 95LX is a class act and



priced right at \$695 list. It's the ultimate evolution of the HP scientific and business calculators of the early 1970s. Once the 95LX's infrared communications link talks to PCs, not just other 95LXs, the file-transfer problem will be finally solved.

The Poqet keyboard finally feels right (unlike early versions) and you can almost touch-type on it. It's the only one with an 80 by 25 display, it really runs DOS applications, and it's smaller than a Filofax or DayRunner organizer notebook, which doesn't fit in your pocket either. At \$1,450, it costs too much. It needs to be a \$995 list machine.

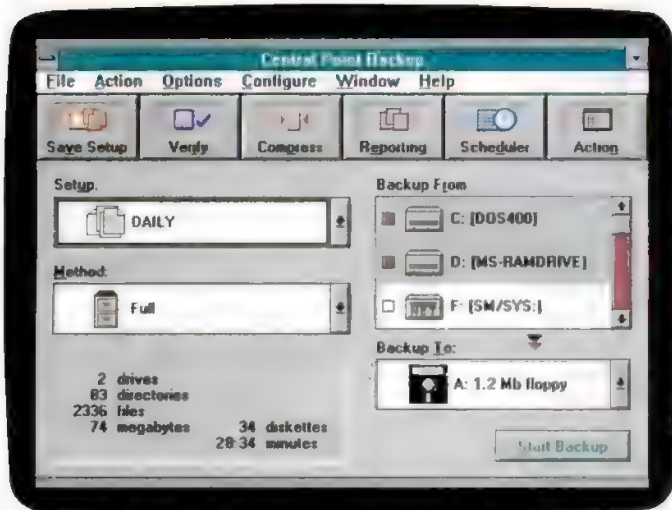
The Poqet is the best of the bunch, but I'd buy the HP. What I really want is any one of these—with a cellular pager attachment that lets your palmtop receive messages anywhere. ■

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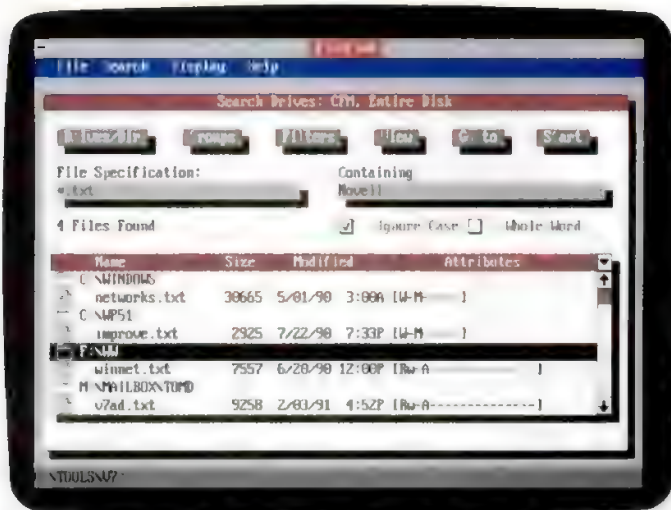
*Brad Silverberg
VP for DOS & Windows
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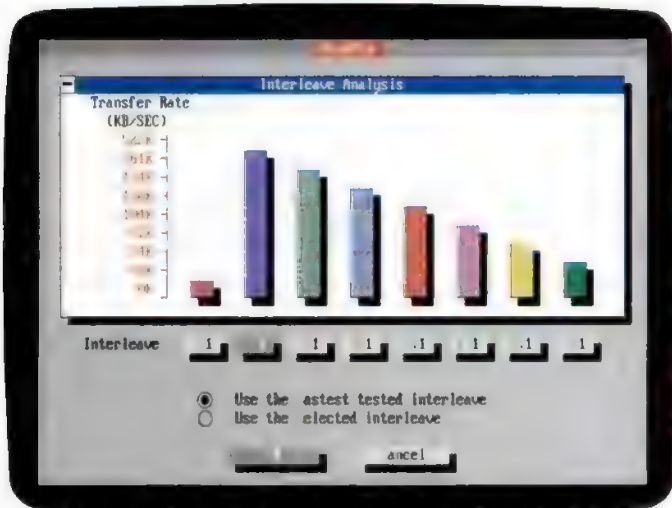
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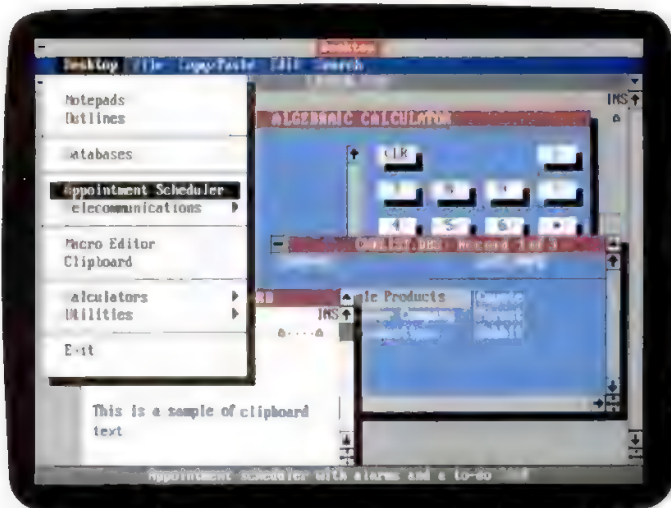
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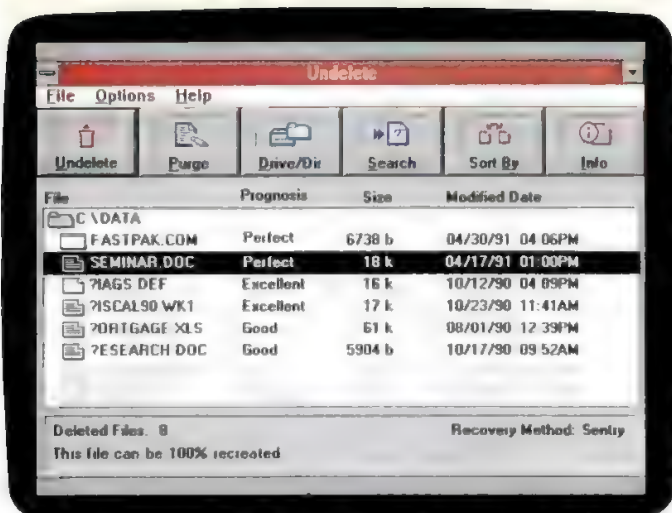
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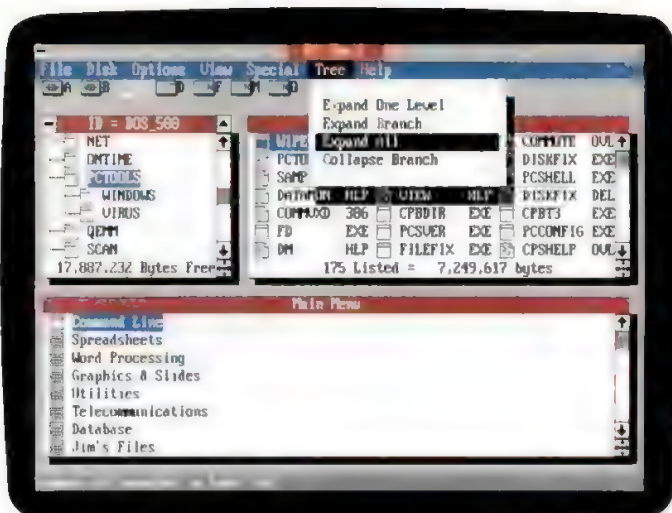
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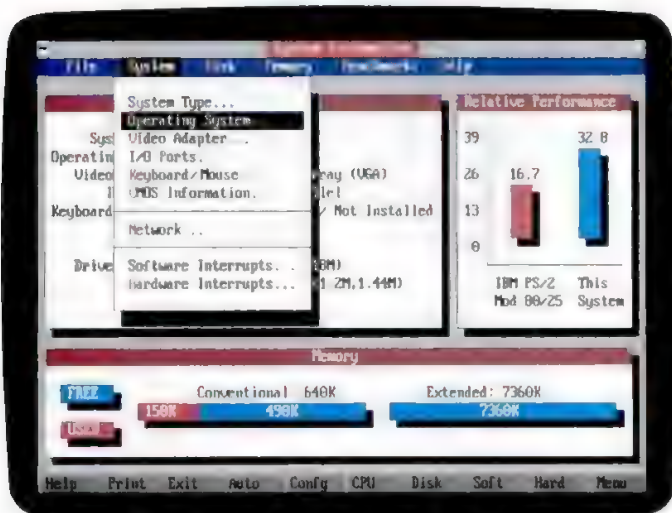
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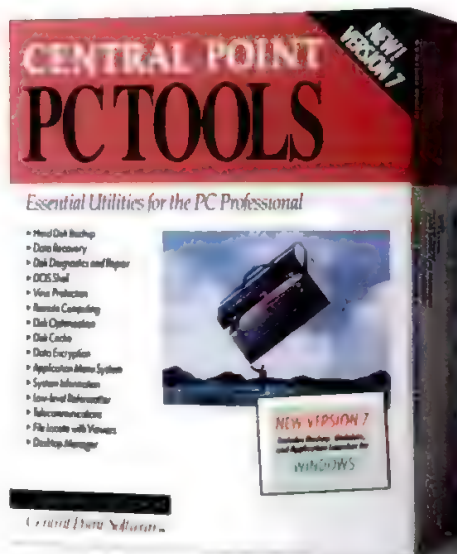
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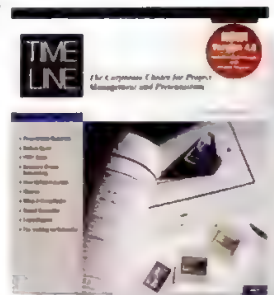
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CIRCLE 344 ON READER SERVICE CARD

COMPUTERS
PALMTOP PCs



An alpha keyboard and tiny screen handicap the quirky Psion Organiser, but its programming language is an asset for vertical apps.

While nonprogrammers will use OPL in conjunction with the calculator, more adventurous users can write their own procedures and add them to the Organiser's main menu, then launch them with a tap of the Exe key.

The Organiser offers mass storage in the form of add-on proprietary modules that snap into two ports on the back of the unit. About half the size of an average thumb, these modules are available as battery-backed RAMs, which Psion calls *rampacks*, or as EPROMs, which Psion refers to as *datapacks*. The rampacks, which are available in convenient 32K (\$105),

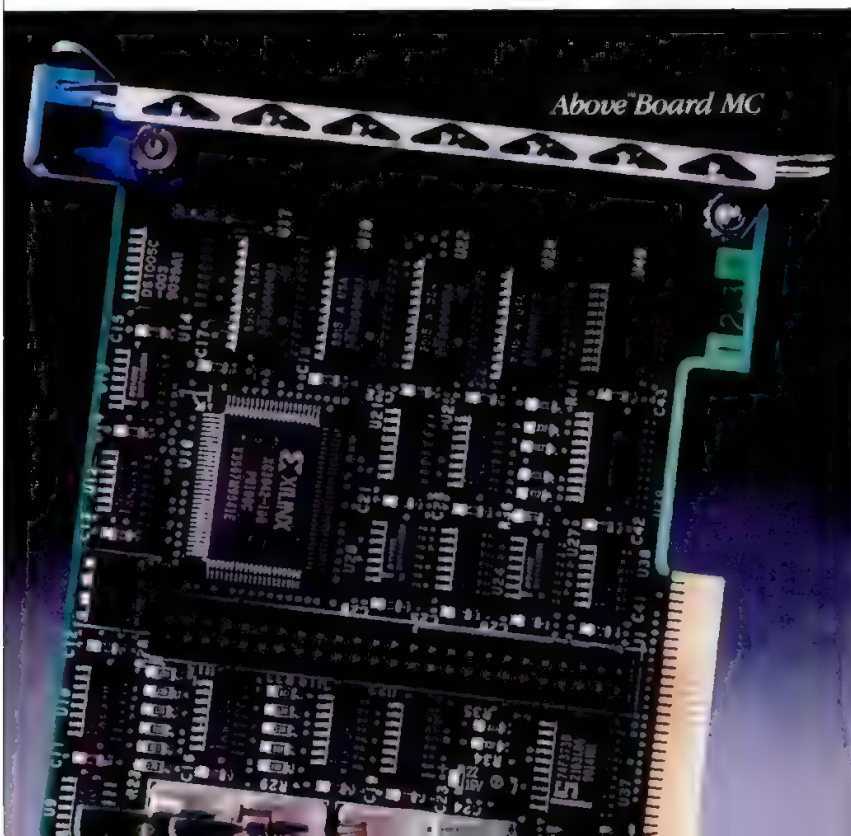
128K (\$263), and 256K (\$368), can be written to, erased, and formatted without any additional equipment.

The datapacks work like the rampacks, except that deleted data is not actually removed until the pack is reformatted using an optional hardware reformatter (\$150). The additional expense of the formatter may be justified by the lower price of the EPROM datapacks, which come in densities of 16K (\$45), 32K (\$65), 64K (\$105) and 128K (\$200). Several datapack users could share one formatter and thereby avoid the higher cost of the rampacks.

Besides these snap-on storage packs, the rear-mounted ports accept storage modules containing ROM-based software. Psion publishes a selection of applications in this format, including a spreadsheet (\$99.99) that writes 1-2-3-format files, two separate finance packs (\$80 and \$100), and a portfolio manager (\$100). All are designed specifically for use with the Organiser.

Even with these enhancements, the Organiser has lagged behind technologically because Psion has not upgraded its

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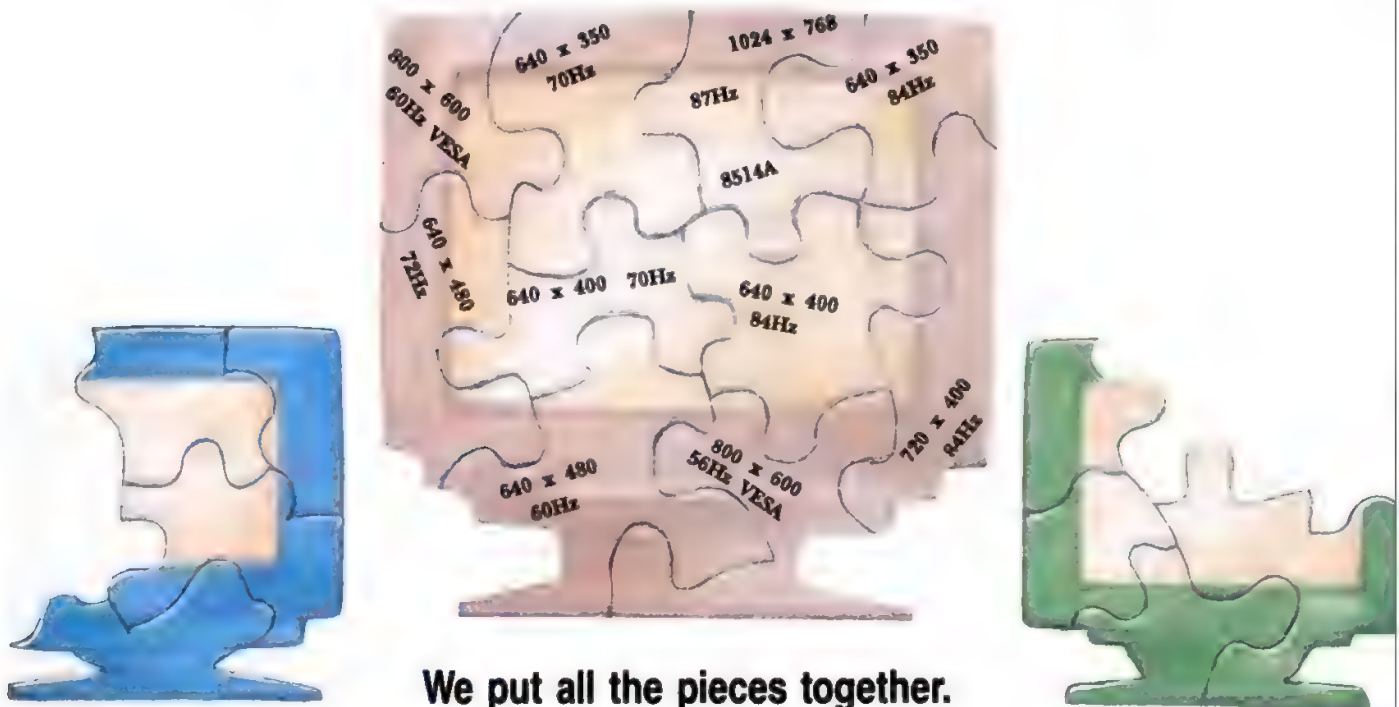
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COMPUTERS PALMTOP PCs

inadequate screen and keyboard. For many users, these are critical deficiencies.

It would be a mistake, however, to dismiss the Organiser out of hand since it has certain unique capabilities that its competitors lack. Support for data acquisition peripherals, for example, makes the Organiser a natural for many OEM or dedicated uses. The OPL programming language—another asset—gives it the flexibility to adapt to a variety of tasks. In addition, the Organiser's built-in software is powerful, flexible, and easier to use than that of just about any other organizer available. If Psion would bring its keyboard and screen up to prevailing standards, the Organiser would be a palmtop second to none.

SHARP ELECTRONICS CORP.

Sharp Wizard OZ-8200

by Jonathan Matzkin

When Sharp introduced the Wizard almost three years ago, it was little more than a fascinating novelty. Driven by a proprietary processor, the first Wizard

had intriguing—but mostly unrealized—expansion and communications potential. However, it was born with an inadequate 16-character by 8-line display and an alphabetically arranged keyboard that completely frustrated attempts at efficient text entry.

Sharp obviously paid attention to criticism of the original model: The \$399 OZ-8200 Wizard reviewed here not only eliminates most of its predecessor's deficiencies but also ranks as one of the strongest entries in the palmtop sweepstakes. It runs on four 6-volt lithium batteries (CR2032) and uses a single CR2032 lithium cell as a memory backup.

The OZ-8200 has a clear, legible 8-line by 40-character display and a completely redesigned QWERTY keyboard. Sharp has efficiently nestled the keys into the Wizard's 0.8- by 7- by 3.8-inch (HWD) case, so that touch typing is possible if not exactly fast or enjoyable. The keys have a springy, yet yielding feel that might seem mushy on a desktop machine but works in this ultra-miniature environment. Besides the usual alphanumeric keys, the key-

board has several rows of Wizard-specific keys along the top.

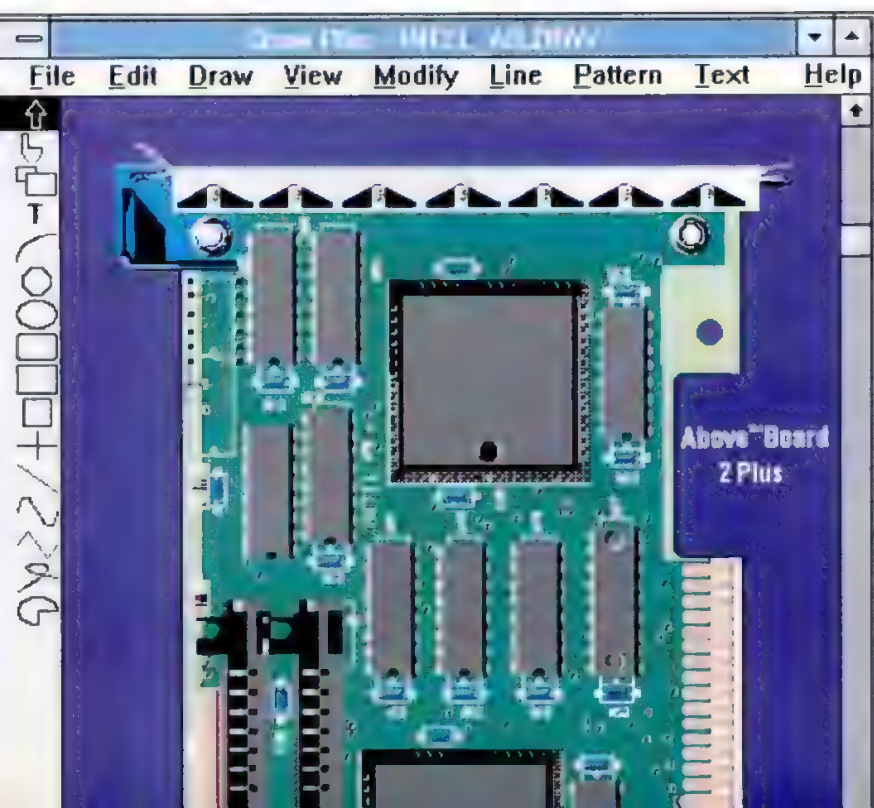
TOUCH SCREEN

The OZ-8200 retains one of the most exciting features of the original Wizard: a small, membrane touchpad, situated to the right of the display, which augments

The Wizard ranks as one of the strongest entries in the palmtop sweepstakes.

the main keyboard. The transparent membrane is actually a window that covers the Wizard's card slot and allows credit-card-sized software ROM cards to display touchpad menus printed on the card's front side. With a software ROM in place, the user accesses the software by pressing defined areas on the membrane touchpad.

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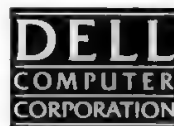
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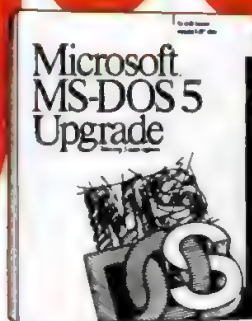
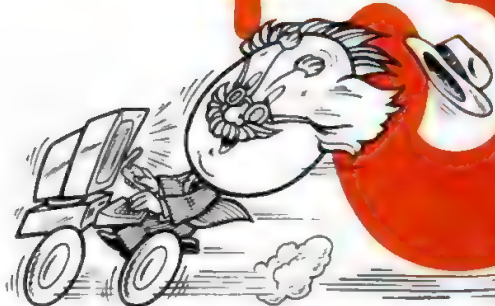
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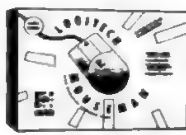


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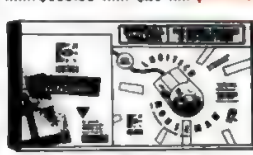
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COMPUTERS

PALMTOP PCs

The ROMs have printed icons, or key labels, that are visible through the membrane and identify the function of each defined touchpad region.

In addition to the software ROMs, the Wizard's card slot accepts RAM cards in 32K (\$80), 64K (\$130), and 128K (\$150) densities.

Sharp offers an array of surprisingly powerful software for its OZ-8200, distributed on the increasingly familiar credit-card-sized ROM cards. Much of this software also runs on two other Wizard models: the OZ-7200 (\$329), which is similar to the original OZ-7000 (\$299) but offers 64K of built-in RAM instead of 32K, and the OZ-8000 (\$359.95), which differs from the 8200 only in that it offers 64K of RAM instead of 128K. At the bottom of the eight-model Wizard line is the \$110 ZQ-2000, which could be called a glorified calculator.

LUCID SPREADSHEETS

The sheer volume of programs available for systems like the Sharp Wizard suggests that palmtops are now viable platforms for development. The Personal Computer Support Group, for instance, developed a Wizard version of its popular *Lucid3-D* spreadsheet (\$180), which supports 3-D sheets (up to 26 columns and 999 rows per spreadsheet file) and draws simple line, bar, and pie charts on-screen. The package comes with software for your desktop machine that not only transfers files to and from the Wizard but also converts them to *Lucid 3-D* or *1-2-3* formats.

Another ROM card, together with Sharp's proprietary 1-by-4.8-by-3-inch Fax/Modem, connects your Wizard to the

world. The battery-powered fax component plugs into a port on the left side of the Wizard's case and transmits or receives faxes at 4,800 bps. The modem portion of the device runs at a disappointing 300 bps, but it's fast enough to transmit electronic

Sharp offers an array of surprisingly powerful software for the Wizard OZ-8200.

mail or information from services like CompuServe. Including software, the Fax/Modem option sells for \$499. A 300-bps, modem-only package costs \$180.

Sharp's *Organizer Link* (\$130) is a hardware/software combination which does for the Wizard what *LapLink* and similar packages do for the PC. A proprietary cable, included with the package, connects the Wizard to your PC's serial port. The software manages file transfers and allows conversion into *SideKick II* or .SDF (standard delimited format) database format. Conversion to *SideKick's* format is quick and easy, and, together

with *SideKick's* schedule reconciliation feature, allows the Wizard to be an equal partner with your desktop PC in managing your time.

Organizer Link functions well as a data hub for the Wizard's built-in applications, but it should also handle spreadsheet files. It shouldn't be necessary to use the software included with the spreadsheet card to transfer and convert files.

DESIGN-YOUR-OWN

Perhaps the most powerful software for the Wizard is marketed by Nictrix Corp. of Leonia, New Jersey. The *Toolkit* program develops simple flat-file database applications on your desktop, then transfers them to the Wizard by an included cable. The applications are written to a special Wizard EPROM card, available in 32K and 128K capacities.

The desktop software lets you map your own Wizard touch-screen functions to the ROM card—a capability that makes possibilities for software like this as endless as they are obvious. A single PC could generate applications to be distributed to Wizard-equipped salespeople or auditors, for example. *Toolkit* sells for \$299 with one 32K ROM card or \$360 with one 128K card. Additional cards are available for \$199 (32K) and \$260 (128K). Nictrix also offers a more advanced version of *Toolkit* that includes relational database functionality and other advanced features.

Other third-party software is available

FACT FILE

Sharp Wizard OZ-8200

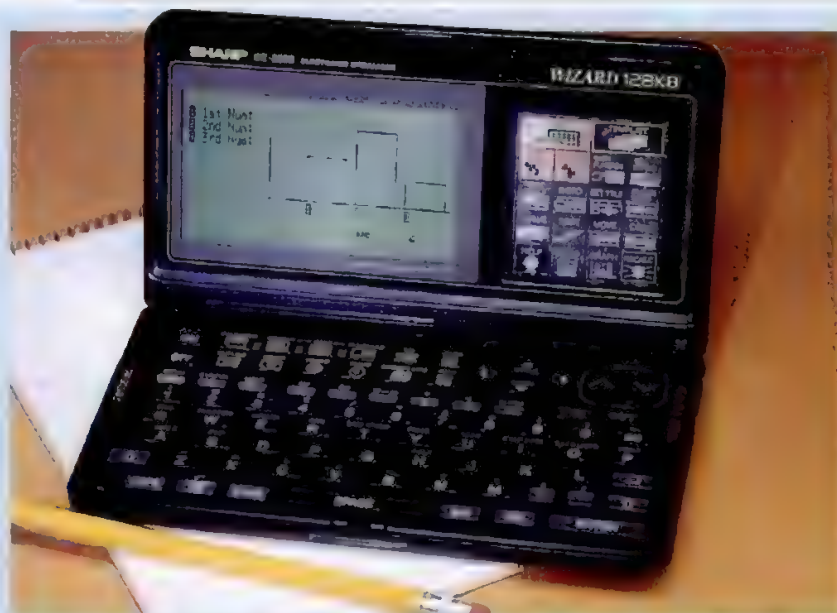
Sharp Electronics Corp., Sharp Plaza, Mahwah, NJ 07430; 201-529-8200.

List Price: With 128K RAM, \$399

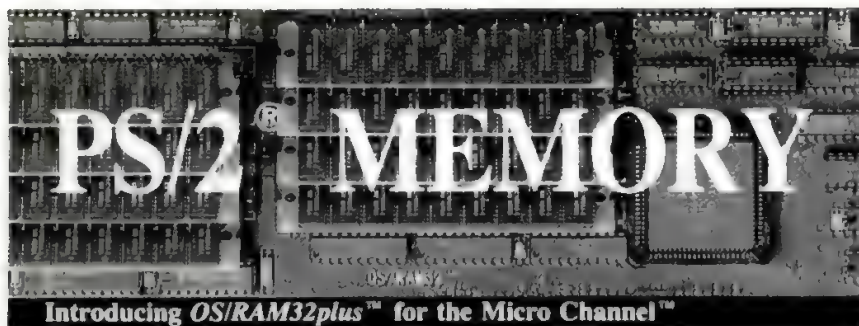
Options: 32K RAM card, \$80; 64K RAM card, \$130; 128K RAM card, \$150; *Organizer Link* for PC, \$130. External Fax/Modem, \$499; 300-bps external modem, \$180.

In Short: The Sharp Wizard OZ-8200 has a proprietary processor and operating system which make it slightly unfamiliar, at first, to DOS users. But it also has a diversity of add-on peripherals and a wide variety of software, much of which can take advantage of its very advanced touch-screen facilities. And, despite its size, the Wizard's keyboard is extremely easy to use.

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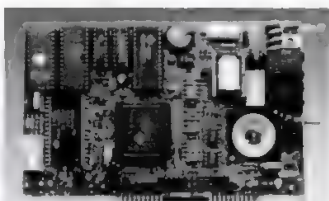
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COMPUTERS

PALMTOP PCs

for use with several of the popular personal information managers or contact managers. Eye-on Associates of Westfield, New Jersey, produces a link to Lotus's *Agenda*. Polaris Software, of Escondido, California, publishes software that transfers data from its PIM, *PackRat*, directly into the Wizard, and Timeslips

Suitability to Task

Sharp Wizard OZ-8200

	1	2	3	4
Communications	☒	☒	☒	☒
Note-taking	☒	☒	☒	☒
Personal finance	☒	☒	☒	☒
Scheduling	☒	☒	☒	☒

Corp. of Essex, Massachusetts, offers a link to *Timeslips III*, a receivables accounting system.

The Wizard's built-in functions—calendar/scheduler, phone list, outliner, memo pad, business card registry, clock and calculator—vary in their complexity and the ease with which they can be learned. Since Sharp made no attempt at mimicking MS-DOS, some keystrokes and procedures may seem somewhat cryptic or unintuitive to seasoned PC users. With a little bit of practice, however, comes fluency.

ADJUNCT EXISTENCE

A few shortcomings in the software, nonetheless, suggest that Sharp didn't always keep PC users in mind. The memo function, for instance, arbitrarily limits entries to 2,048 characters, and word wrap takes effect only after you store and recall an entry for the first time.

Even so, because of its strong and growing third-party software support, the Wizard is well worth considering as an adjunct to a desktop or laptop PC. Several of the already available software titles are designed to integrate with desktop software, and more are undoubtedly on the way. And as Nictrix's *Toolkit* demonstrates, the Wizard's touch screen has vast potential as a productivity tool. ■

Joel Dreyfuss is the editor of PC Magazine. Bill Howard is an executive editor of PC Magazine. Bill Machrone is editor-in-chief and publishing director of PC Magazine. Jonathan Matzkin is an associate editor of PC Magazine. Tom Unger is a staff editor of PC Magazine.

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ONES PEOPLE
ACTUALLY
USE”**

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find on the T2000SX: An 80386™ SX processor with a math coprocessor socket, VGA compatible display, 1 MB (expandable to 9MB) of 80 nsec RAM, a 60 MB hard disk with 19 msec access time and 1.5 MB/sec data transfer rate.



The T2000SX has a 60MB hard disk with 19 msec access time.

But more important than the specs themselves, is the way the T2000SX lets you

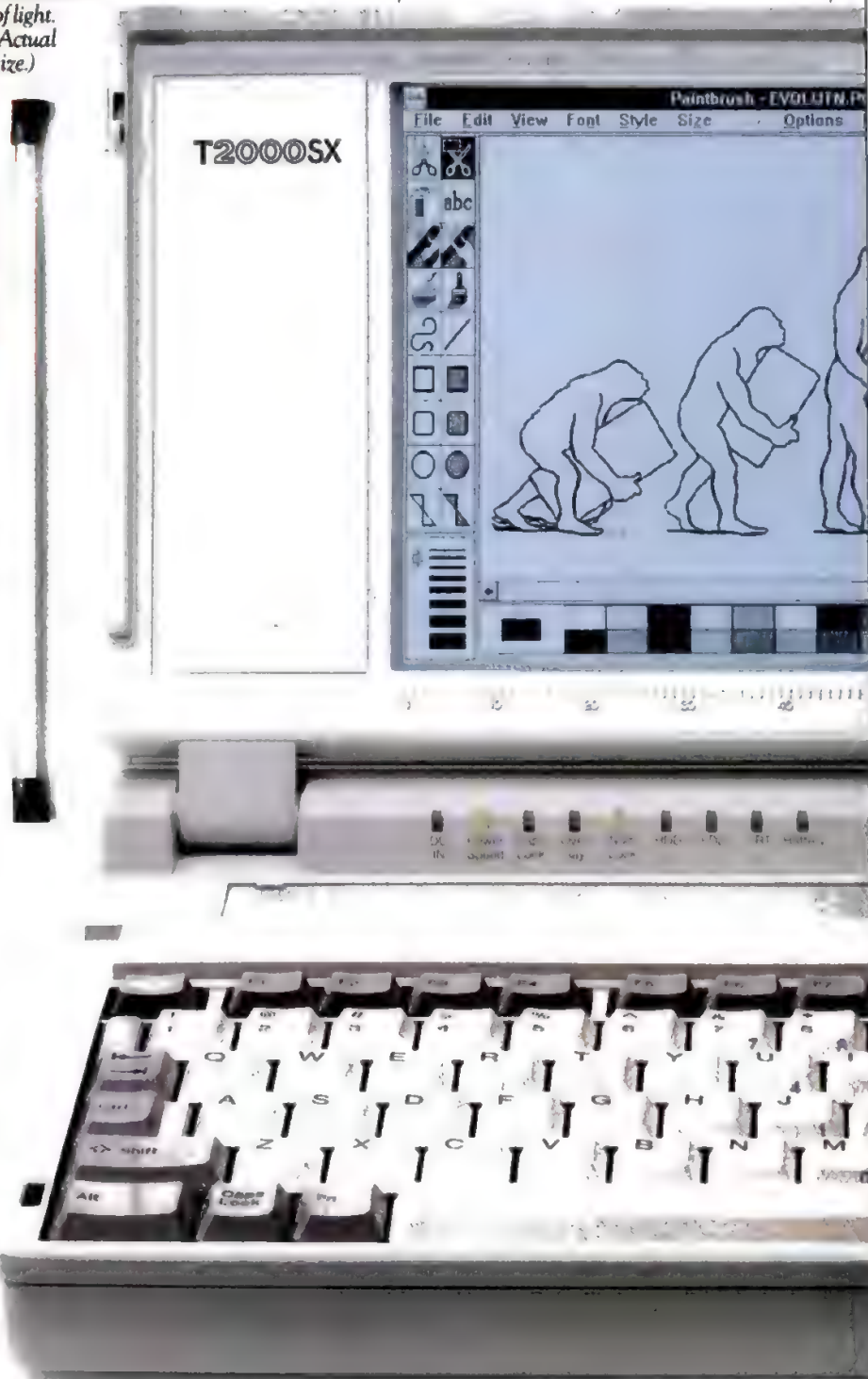
use them. Which is more often.

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personal computing.*

Because the T2000SX can fit easily into a briefcase (it weighs a scant 6.9 pounds), you can take it anywhere you go and use it in more ways than you can imagine.

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Our internal AutoResume back up battery automatically saves your work if your main battery runs out.

business proposal? The T2000SX gives you the freedom to do it from a train. The client wants an estimate on costs? You can give it to him right then and there—wherever there is.

No more wasting time running

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But just in case there's something



Our user-installed memory card allows you to add up to 8 MB of memory yourself

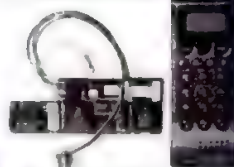
back at the office you still need, you can get back to it with our optional built-in modem. Which supports industry standard error corrections and data compression (CCITT V.42, V.42bis, MNP® 5). It even supports cellular data communications via our optional smart cable adapter.

The T2000SX also has a unique feature you won't find on any other computer in the world. It is called AutoResume.

AutoResume. Think of it as a bookmark for your computer.

AutoResume automatically saves whatever you're working on whenever you turn the computer off. And it lets you go directly to the program you were using last when you're ready to start up again. So you don't have to reboot, restart your application and reload your files.

AutoResume



The T2000SX has an optional modem that allows data communications via a cellular phone.

also helps save on battery life and it allows you to change batteries without losing an ounce of information.

As for batteries, the T2000SX touts the latest in battery technology—Nickel Hydride. Nickel Hydride delivers 22% more watt-hours per pound than NiCad and it doesn't suffer from memory effect.

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Okay, let's wrap this thing up.

These are just a few of the reasons why we believe the T2000SX is the most useful, and therefore, most powerful computer in the world. And why PC Week® Labs said, "the T2000SX offers performance comparable to the LTE 386s/20, plus many of the design features that have made Toshiba a market leader in portable PCs."

PC WEEK

We invite you to learn more about the T2000SX and Toshiba's best-selling line of portable computers by calling us at 1-800-457-7777 for a complete information kit.

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The T2000SX comes complete with Hypertext on-line documentation.



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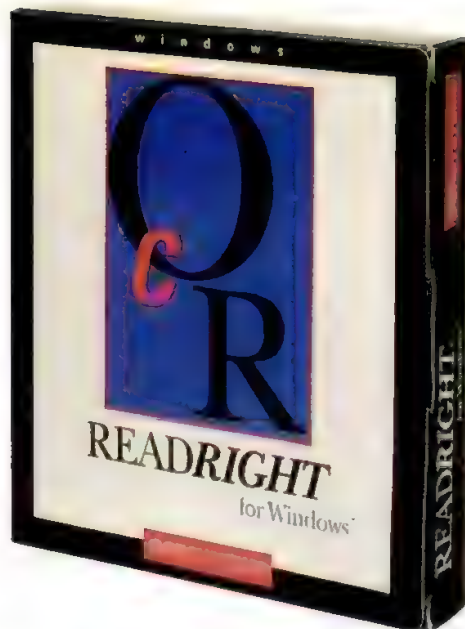
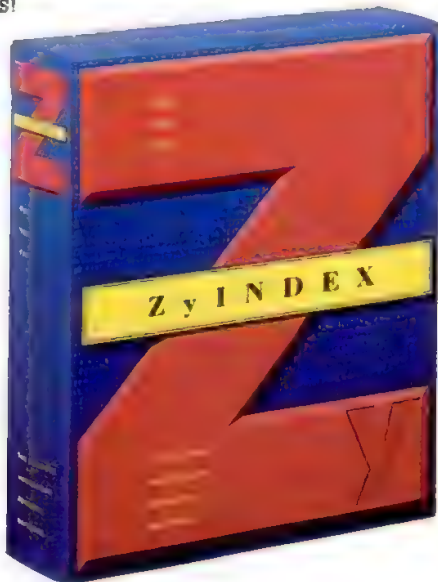
Like a built-in dictionary that enhances ReadRight's already impressive accuracy. You can even add your own words to a user dictionary. And with the pop-up error checker, you can proof the recognized text against the scanned image without ever looking back at the original document.

ReadRight automatically separates text from graphics, even on pages with complex formats, for faster text recognition. Or if you don't want to put the whole page online, you can clip the paragraphs that you want ReadRight to recognize. You can design templates to quickly process pages with similar layouts. And ReadRight handles stacks of pages, single- or double-sided. You can even defer processing so your computer isn't tied up when you need it.

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Prepare your entire drive for searching with just one keystroke. So if you work on a network or with frequently updated text, you don't have to go through long procedures to find new information.

And searching is easy. To find a word, just enter it. All instructions are in plain English on the screen when you need them.

ZyINDEX provides a full set of search techniques. Like Boolean logic (AND, OR, NOT) searches. And wildcards so you can find forms of words—such as "combine," "combination," and "uncombined"—in the same search. You can even do proximity searches to find documents that contain words which you know will appear near each other. Or search by phrases, so if you're looking for "New Jersey," you don't also find "New York" and "New Mexico."

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A picture may be worth a thousand words (or numbers), but charts and graphs are not always the best way to make sense of geographical information. These three PC-based mapping packages help you put your data into the big picture.

Mapping Software

Analyzing a World of Data

Computer mapping software, like business charting software, makes the production of data maps enormously easier by automating the graphics. But this ability is far from being representative of its entire potential. Linking the map to a live database not only lets you generate data maps dynamically, but also opens up the possibility of using geographical relationships to manipulate the data; for example, to

by Robert Kendall

find points within a certain distance of a place. The most powerful of these programs are called Geographic Information Systems (GISs).

GIS software was originally developed to handle specialized applications such as land-use planning and environmental analysis, and until recently GISs were mainframe or minicomputer applications accessible only to specialists. In the past few years, however, the growth of PC power has brought the benefits of this once arcane software within the reach of more people. Today you can use these powerful programs (which once required the processing power of an entire data center) right on your desktop.

The core audience for PC-based GIS programs is still the planning professionals who use them for desktop analysis of anything from population shifts to crime patterns. But they have also become useful tools for business people. Salespeople, for instance, use them for locating potential customers and plotting regional sales strategies. Public and private administrators use them for projecting the best locations for new stores or offices and for allocating resources among facilities. Market researchers use them to analyze and project regional trends and to plan direct-mail surveys and campaigns. GIS software is potentially useful wherever information has a geographical component, and as the technology continues to mature, it is bound to grow in the diversity and power of its applications.

A PRACTICAL SELECTION

In this review, we evaluate three general-purpose mapping programs that produce data maps from database information and are capable of performing some of the address-matching and spatial-analysis functions characteristic of a GIS. *Atlas*GIS* from Strategic Mapping (\$2,495), *GisPlus* from Caliper Corp. (\$2,995), and *MapInfo for Windows* from MapInfo Corp. (\$995) bring minicomputer-based power down to the PC in an interactive and relatively inexpensive form. (MapInfo Corp. also has a DOS version of *MapInfo* that is not reviewed here.)

What distinguishes all these products from simpler mapping programs (see the sidebar "Alternative Routes to PC Mapping") is their use of true latitude and longitude coordinates to define map features. This allows all kinds of maps and geographically based data to be overlaid

on a common system. Thus, these programs can generate not only thematic maps in which regions are shaded, hatched, or distinguished according to underlying data values, but also pin maps, which plot locations and routes in their exact geographical relationships. All have multi-layered map displays and a wide range of standard database functions for analyzing map-based data. The programs also produce hard-copy maps on printers or plotters for presentation.



We chose to review products priced under \$3,000, since these are the most likely to be of interest to a broad range of users. A host of more expensive PC-based systems, most of them designed for very specialized purposes, are also available. *PC ARC/INFO* from ESRI, for example, comes as a \$1,495 Starter Kit but requires the addition of extra-cost modules for functions such as overlaying map layers and producing presentation output, which bring its total cost to \$4,995. Another modular system, available in configurations from \$2,000 to \$16,000, is Tydac Technologies' *SPANS*, while a \$5,000 program called *MGE PC-1* is forthcoming from InterGraph. Two other mapping packages are actually add-ons to *AutoCAD*—Facility Mapping Systems' *Facility Mapping System for AutoCAD* (\$3,000 to \$6,000, depending on options) and Generation 5 Technology's \$9,500 *Geo/SQL*.

The integrative capabilities of *Microsoft Windows* has led some programs to take a different modular approach. Hyperdyne's *Mapix* (\$1,795) and the recently released *MARS* from Montage Information Systems (\$1,595) both have geographical capabilities, but they rely on DDE links to other *Windows* programs, such as *Microsoft Excel*, to handle data

management. *Mapix* is notable for its innovative use of scanned maps, while *MARS*' claim to fame is its comprehensive spatial analysis functions.

A MAP OF MAPS

The core of a GIS is vector map files, and getting the maps you want is one of the most critical (and potentially expensive) aspects of using a GIS. The map files used by these products typically come in ASCII format and contain a series of precise coordinates that define geographical entities. Regions (such as state or county boundaries) are defined as polygons, routes (such as roads and waterways) as line segments, and locations (such as cities or buildings) as points. Together, they form a base map on which to display your own geographically based data.

All three of these programs come with a basic selection of map files, including U.S. states and counties, but unless your data is fairly generic, count on purchasing additional maps—pretranslated from the vendor of your mapping program or in an importable format from third parties. (See the sidebar "Digital Maps and Where to Get Them.") Most GISs can use the highly detailed street-level TIGER files from the U.S. Census Bureau (which contain demographic and address data as well as geographical features), but getting them in a format supported by your system can be costly, depending on how much they've been cleaned up and who produced them. It's important to work the cost of the maps you need into your overall purchasing decision.

Fortunately, most of these products also support digitizing tablets, which let you convert paper maps to a format your mapping program can use and (more importantly) update your existing map files as the world around you changes. *GisPlus* goes a step further by letting you import scanned aerial or satellite photos into your files and trace over them on-screen. Finally, you can import maps created in CAD systems and those from high-end GISs by importing them into *AutoCAD*'s .DXF format, a robust vector format that has become a de facto standard for interchanging maps.

While latitude and longitude is the most common geographical coordinate system, others are in use. State government agencies typically use the State Plane coordinate system. All the packages also let you define an arbitrary x,y coordinate system so you can digitize a paper map

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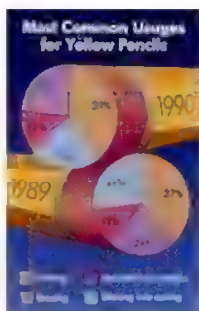
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GRAPHICS MAPPING SOFTWARE

even if you don't know its exact longitude and latitude coordinates. You also have the option of using a number of different projections; that is, the systems used to create a flat representation of the spherical surface of the earth. It is important to choose the right one for your purpose. An orthogonal Mercator projection is an acceptable choice for a relatively small area such as a city, but for thematic mapping on a national scale you'll want an equal-area projection because it doesn't distort the relative areas of the regions.

TOOLS FOR ANALYSIS

At the simplest level, you'll want the ability to select points or regions on the map based on field values in a database and to identify them in distinctive ways. All the programs give you basic database management functions for performing queries and selections, offer a range of ways to aggregate records on the map, and let you do global updates, appends, and joins. The programs also give you worksheet or table views (sometimes both) for editing the database records and let you perform mathematical operations (including summary statistics) on numeric data.

Data handling varies among packages, however. *Atlas*GIS* uses the PC-standard .DBF format as its native database format, which is a big help in integrating your GIS smoothly into your existing database environment. You can also update and manage your information using a conventional database, while tapping into these files as needed from *Atlas*GIS*. *GisPlus* uses a proprietary format for its database, requiring a preliminary import step; however, it also supports SQL queries. *Map-Info for Windows* offers the broadest data handling of all—reading .DBF, .WK1, .XLS (*Excel*), and delimited ASCII files directly, and supporting SQL queries for great flexibility.

Equally important to these programs' analytical capability is their multilayered design. Maps can be enormously complicated, but by storing different types of features and various data files on separate layers that you can display or hide independently, you can more easily pare down the display to what you want to view. Layers can also be used to hold different levels of detail. For example, you might put county boundaries on one layer, ZIP code boundaries, major roads, and city borders on the next, and a street grid on the third. At the full-page view, you might see

only a few layers that contain large-scale information such as boundaries and major roads. As you zoom in closer, however, additional layers with more detail would appear.

MASTERING SPACE

Although they handle ordinary database queries and manipulations, GISs are uniquely suited to answering questions that can't be answered without recourse to positional information. Finding the sup-

pliers within a 50-mile radius of a store and aggregating the sales for stores that fall within several sales regions are just two examples of such tasks. Depending on your application, you may find use for more-advanced GIS capabilities, such as the ability to define a buffer zone around a line, region, or group of map features, or to create a new region that is the intersection of a number of other regions.

In the real world, data records don't often come with map coordinates attached. They tend to be located by means of other positional information: a ZIP code, parcel



MAPPING SOFTWARE: SUITABILITY TO TASK

Mapping programs differ in their strengths and weaknesses. Use these informed, subjective ratings to assess a program's suitability for the various types of mapping tasks.

THE TASKS



Thematic and pin mapping rates the program's suitability for creating thematic maps and for plotting locations and routes. Considerations include the number and quality of thematic map types, the range and breadth of data range options, and the handling of colors, fill patterns, point styles, and line styles.



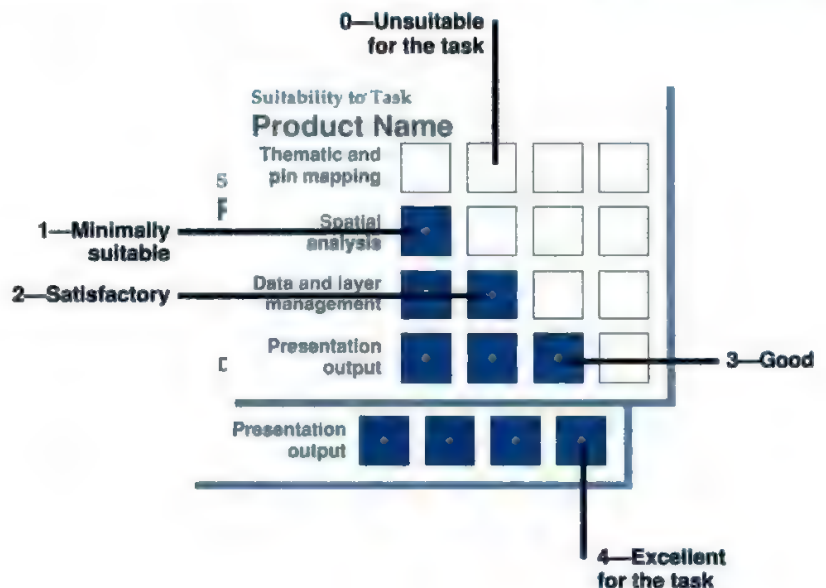
Spatial analysis rates the program's ability to handle the various kinds of geographical queries. Considerations include the quality of its radius and buffer options, its ability to aggregate data based on spatial queries, and special functions like distance measurement and routing.

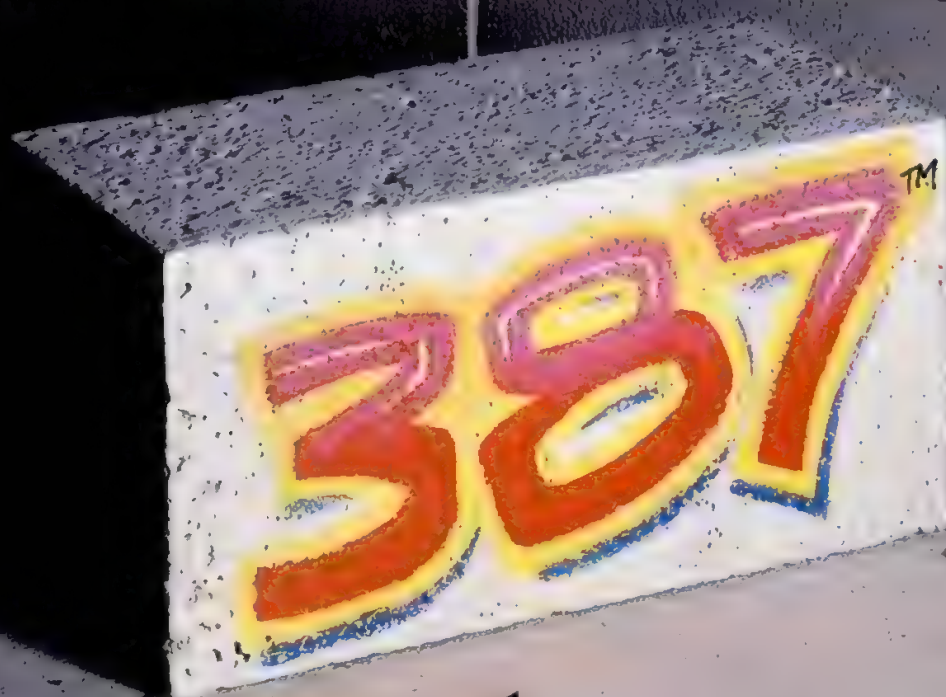


Data and layer management evaluates the package's suitability for managing geographical data, maps, and database tables. A satisfactory rating reflects the strength and ease of the database management functions (queries and joins, for example), the usefulness of the package's data-import and geocoding facilities, and the quality of its layer-handling functions.

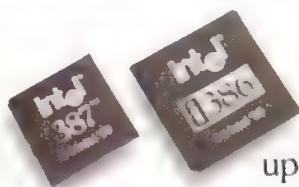


Presentation output evaluates the program's ability to create high-quality maps for publication or presentation. The strength of its map layout and annotation features, the quality of its fonts, the range of its options for exporting completed maps, and its support for high-quality monochrome and color output devices are the most important considerations for this rating.





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MAPPING TERMS: An Illustrated Glossary

MAP FILES



The map files (also referred to as boundary files) used in PC-based mapping programs contain a number of elements that together represent the geography of a region.

These elements include polygons (representing regions), lines (representing routes such as highways and power lines), and points (representing locations). All elements are located precisely within a common coordinate system so that they can be overlaid in their proper relationship to one another, and spatially based data can be plotted in their correct positions.

The design of each map file differs according to its intended use. Public planners, for instance, use maps broken up into the zoning districts or census tracts on which their data is based. On a state or regional level, a great deal of demographic and marketing data is county-based; hence the popularity of U.S. county maps. Sales regions and direct-marketing campaigns, however, are often based on ZIP code regions, and since these regions are easy to match with addresses, they are useful for other purposes as well. City maps show the entire street grid as well as local political boundaries.

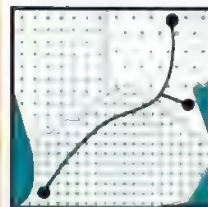
THEMATIC MAP: RANGED FILL



One of the most-common types of thematic maps is the ranged-fill map, in which colors or fill patterns are used to classify regions within two or more numeric

ranges. Thematic mapping programs offer a wide variety of ways to select ranges. You can select the number of ranges you want and calculate them automatically by quantiles (an equal number of data records in each range), equal proportions (an equal number of map regions in each range), percentages, or standard deviations. You can also base the ranges on user-entered values or on expressions (for example, to shade only those regions with gross sales above \$500,000 and profit margins over 20 percent). In some packages, you can even show two separate variables on the same map (called a bivariate map); for instance, the hatch pattern might stand for population, the color for the majority ethnic group.

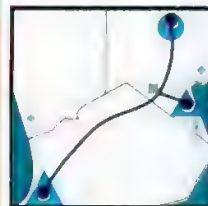
THEMATIC MAP: DOT-DENSITY AND PROPORTIONAL FILLS



Another popular type of thematic map is the dot-density fill, in which each dot represents an equal value or an equal number of records.

These are good for showing population figures, with each dot representing a given number of people. If the regions are of approximately equal size, the density of the dots parallels the density of the population. You can achieve a similar effect with ranged fills by using a proportional fill, which uses hatch patterns of progressively increasing density to represent increasing values.

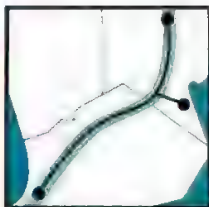
PIN MAP



A pin map is simply a map on which points are plotted. A computer mapping package lets you do a lot more than a paper map with pushpins, however. Not only can

you classify different types of points or locations by the shape, color, or size of the point symbol, you can also vary these symbol attributes according to some underlying data value. For instance, you might plot branch offices with symbols in proportion to their gross sales, or assign a distinct color to cities with a population of over 50,000. You can also bring up the data records on points by clicking on them, which adds another dimension to the ordinary pin map.

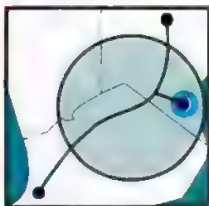
LINE MAP



A line map is very similar to a pin map, except that it displays routes such as roads, railroads, rights of way, pipelines, power lines, or waterways, instead of locations.

As with points, you can code different types of lines by varying the line weight, style (such as dashed or dotted), and color, and choose to vary any of these elements according to data values; for example, you might increase the line weight in proportion to the traffic load on a road or highway, changing the color to red when it exceeds a certain critical threshold.

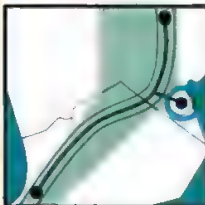
POINTS WITHIN A RADIUS



Because a true geographical database stores the coordinates of every feature, it's possible to perform queries or other operations based on spatial relationships.

One of the simplest examples is to locate all of the points or regions on a map that fall within a given radius of another point—finding the branch offices or ZIP codes within a certain number of miles of the main office, for example. You can combine spatial queries with thematic and pin mapping to illustrate data. One common example is to aggregate the data in a group of counties within a given radius from the city center, treating it as a single metropolitan area.

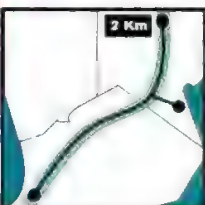
BUFFER ZONE



The ability to find points within a radius is the simplest case of a buffer zone—one centering around a point. Some packages let you define buffer zones around lines

and regions as well. You can even define ring- or doughnut-shaped buffer zones; for example, one that consists of an area between 2 and 20 miles from a given point. Such capabilities make it possible to perform more-sophisticated queries. A 500-yard buffer zone on either side of a highway, for example, may identify households, pipelines, or other elements that might be affected by construction work; a buffer zone around an industrial site could indicate how many people might be affected by pollution from the plant.

DISTANCE MEASUREMENT AND ROUTING



Yet another benefit of the coordinate-based design of mapping packages is that it makes distance measurements a snap. Most packages let you find out the direct distance between two points, a matter of simple trigonometry. A more complex task is to trace the distance of an actual land route. This requires the system to have some knowledge of multistep routes. The most complex job of all is routing, using the computational power of the computer to find the shortest or fastest route between two points in a network of routes. This capability is most often used in the planning and scheduling of deliveries. With speed and distance data, you can make reasonable estimates of the time it takes to complete various routes, taking into account such factors as traffic and the barriers of one-way streets and low bridges.

GEOCODING AND ADDRESS MATCHING



Real-world data is most commonly linked to geography by addresses. So an essential step in plotting such information on a map is "geocoding," in which map coordinates are attached to each data record based on its address. Since sales territories and direct-mailing regions are often based on ZIP codes, a fairly simple way to geocode such data for large-scale maps is to use special data files called "ZIP code centroids," in which each ZIP code is represented by the coordinates of the center of its corresponding region. This is not close-grained enough for maps on a metropolitan scale, however; in those cases, you must use a process of address matching, parsing each address into its component parts to determine the building's precise coordinates. Address-matching capabilities can also be used to highlight addresses individually.

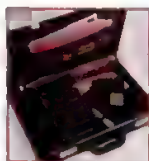
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Massive Power and Storage

Moby Brick is only about the size of a ream of copy paper and weighs 8.9 lbs., yet it packs full desktop power with either a 20 MHz 486SX or 33 MHz 486DX processor with up to 32 MB RAM. The new Intel 486SX is faster than a 33 MHz 386DX; the 486DX is twice as fast and includes a built-in numeric coprocessor. A modular processor board allows easy upgrades from the 486SX to the 486DX at any time.

Bricks use fast, reliable IDE Conner hard disks ranging from 44 MB up to 510 MB. The unique BIOS integrated disk cache (up to 8 MB) offers lightning quick access times. The bus is selectable between 8 MHz (AT standard) or 10 MHz which improves video, disk and network performance. Other standard features include a 2,400bps modem, 3.5" 1.44 MB floppy, 180 pin docking connector and an ISA 16-bit internal half length expansion slot. The "Stretch" Brick, which is 7" longer, accepts one full and one half length card. The rugged aluminum case with shock

absorbing rubber corners is available in granite or beige along with color coordinated keyboards and monitors.

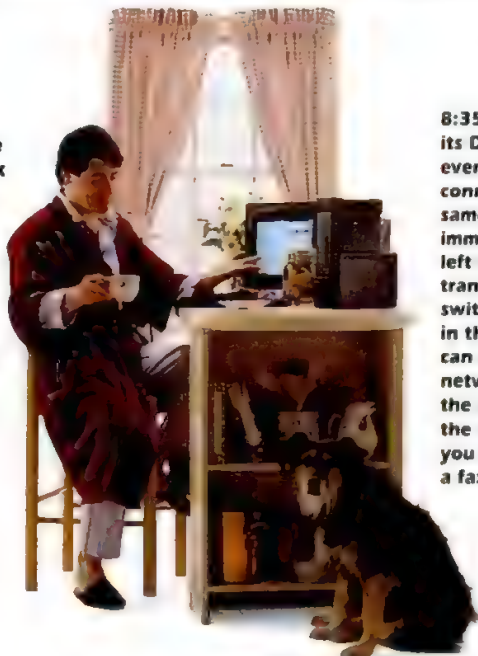
Extraordinary Graphics

Moby Brick features built-in 16-bit Super VGA graphics with 1 MB RAM. Maximum resolution is 1024 x 768 non-interlaced. The Edsun CEG (optional at no extra charge) provides antialiasing to double the apparent resolution and provides 32,000 simultaneously displayable colors for stunning photo-realistic graphics. Now you can say good-bye to the jaggies, even on low resolution 640 x 480 monitors or overhead LCD projectors. Fast, HI-RES drivers for all major applications are provided, including a Display List Driver for Autocad.

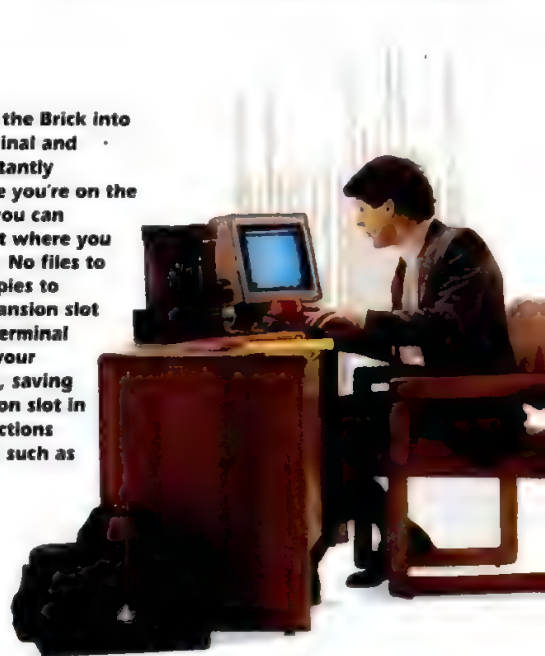
Good to Go

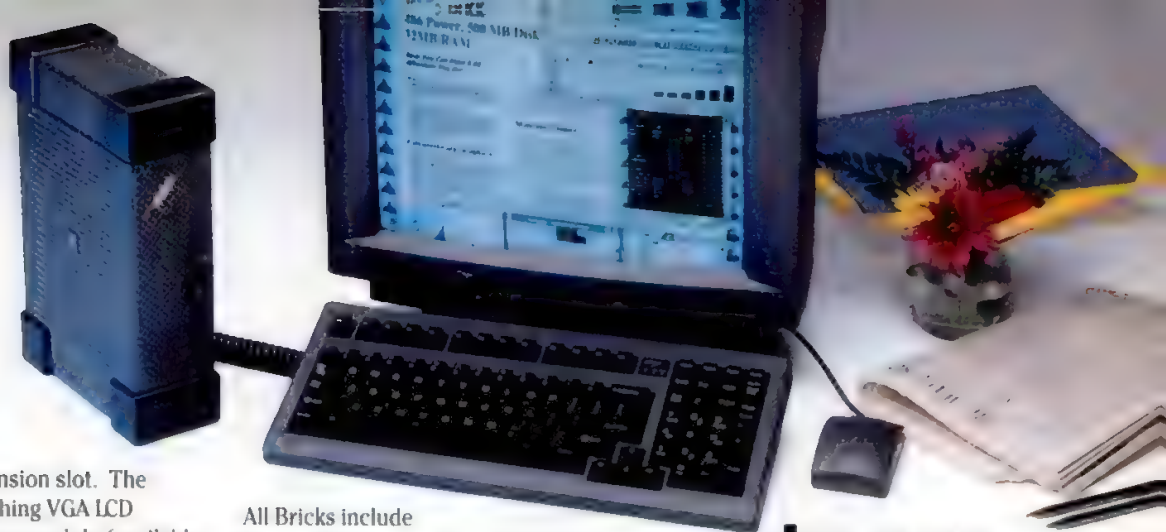
The innovative Ergo design provides perhaps the best benefit—versatility. You can use the same Moby Brick as a fast, quiet, stylish desktop at each of your regular destinations, such as your home and office. The optional Docking Terminal provides instant hook-up of all cables as well as a second 16-bit 3/4 length

6:25 a.m. You can start your day before heading to the office. An hour of quality work time before the onset of office interruptions (or at home in the evening) can be the most productive time of your day. With up to 510 MB of storage you can keep everything with you. All your files, addresses, even the ones you didn't think you needed, are at hand.



8:35 a.m. Drop the Brick into its Docking Terminal and everything is instantly connected. Since you're on the same computer you can immediately start where you left off at home. No files to transfer, no floppies to switch. The expansion slot in the Docking Terminal can be used for your network adapter, saving the internal option slot in the Brick for functions you need off-site such as a fax board.



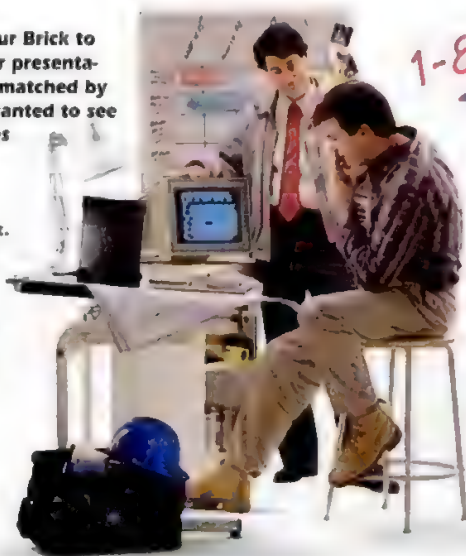


expansion slot. The matching VGA LCD display module (available in August) turns Moby Brick into a portable, go anywhere solution. The LCD features a 64 gray scale controller and the latest Sharp thin film, super twist, backlit LCD technology.

Innovative Software

The Brick's system software has features not available in any other PC. (You might expect this from Ergo, since we're a leader in DOS Extender software with customers like Borland, Fox, and Cadam.) This includes a reprogrammable BIOS with user tunable keyboard control, password protection, and non-volatile owner identity. Updates to the latest release are just a phone call away. This BIOS also includes an integrated disk cache that is significantly faster than add-on software caches. System and video shadow RAM are provided, plus a (192K) block of high memory above 640K for loading high TSRs, networks and other resident utilities.

2:52 p.m. Take your Brick to the client to deliver presentations that can't be matched by hard copy. They wanted to see what a few changes would look like. No problem, you have the whole design on the Brick. With the power of a 486, it looks easy. A PC as handy as the Brick can really change the way you work.



All Bricks include the new DOS 5.0, and your choice of Windows 3.0 plus Adobe ATM with 13 fonts, a Logitech mouse or DESQview/386 with QEMM. Whichever environment you choose, your Brick will come fully set up, fine-tuned and ready to go. There's even on-line Hypertext manuals for the Brick and DOS. All Bricks are 100% IBM AT-compatible and support DOS, OS/2, UNIX, X/Windows and Novell.

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- 1024 x 768 Super VGA adapter supports EGA, CGA, MDA monitors
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- 2,400bps Hayes compatible modem
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- Reprogrammable Ergo BIOS with video and system shadow RAM, full diagnostics
- 3.5" 1.44 MB Teac floppy
- One 16-bit half length internal expansion slot, plus Docking Terminal port
- Worldwide compatible ext AC power supply 2.5 lbs 2.5 x 4 x 6
- Rugged aluminum case with rubber corners and liquid heat sink technology
- Choice of Granite or Beige
- 8.4 to 8.9 lbs, 3.3 x 7.9 x 11.3" 486 or 386SX
- Ergo MS-DOS 5.0 plus your choice of: Windows 3.0 with Adobe ATM, Mouse, or DESQview/386 with QEMM Manifest, Tree86

Options

44 MB 24ms hard disk	deduct	\$400
212 MB 16ms hard disk	add	\$600
510 MB 13ms hard disk	add	\$1,500
Additional RAM (SIPs) per MB		\$100
Docking Terminal w/ 16-bit slot		\$395
VGA LCD module & adapter		\$995
101 keyboard-beige or gray		\$109
120 MB ext tape backup		\$495
5.25" ext 1.2 MB floppy		\$239
Additional Power Supply		\$195
Brick Bag		\$99
14" 1024x768 non-interlaced color SVGA monitor		\$495
15" 1024x768 non-interlaced color SVGA monitor		\$895
17" 1024x768 non-interlaced color SVGA monitor (shown above)		\$1,395



number, street address, or some other geographical label. Therefore, before you can do geographical analysis, you must be able to put your data records into their proper place in the coordinate space on the map, a process better known as "geocoding."

A practical method of geocoding for many business applications is to match ZIP codes with the coordinates of the ZIP code centroid; that is, the geographical center of the ZIP code area. This method has the advantage of simplicity and works well on a metropolitan or larger scale, which is why the vendors of our review products include ZIP code centroids with their packages. Its main drawback is that local post offices often haphazardly add new ZIP code areas, so it's practically impossible to get an up-to-date national ZIP code listing.

Street-level geocoding requires "address matching," which involves comparing your address data to the address locations in a TIGER file or other map file that contains this information. As you might expect, accurate address matching is a highly involved process. The computer must be able to parse the addresses into their component portions, taking into account all the human inconsistencies of addressing conventions and matching the pieces with the often perverse systems of street numbering used in American cities. Special provisions are needed to guard against duplicate matches, and you must be able to use alternative street names and to relax matching criteria in some cases. Address matching on a database of any size takes a long time, so be prepared for

The sheer complexity and scope of these products demands a serious investment in commitment.

an extensive transition period.

Of the three products in our review, only *GisPlus* supports "routing"—the ability to find the quickest way between two points along a road network. With *GisPlus*, you can take into account such impediments as speed limits, one-way streets, and traffic volumes to find the best practical route—a boon for planning delivery routes. (Other products useful for this purpose are *StreetSmart* from Street Map Software (\$349) and *Streets On a Disk* from Klynas Engineering (\$225), which let you perform routing and pin mapping on TIGER-based city maps.)

THE FINAL RESULT

Of course, the appearance of the final product can't be overlooked. Almost everyone who works with maps needs to publish them or to present them to an audience at one time or another. All of the packages can generate hard-copy maps using a pen plotter (still the most widely supported color output device for mapping products), and most support a range of black-and-white and color printers as well. For those interested in using maps within a desktop-published document, all of the mapping programs can export to at least one graphics file format.

Subtler considerations play a part in output quality. If you regularly produce thematic maps, your mapping package must offer the tools you need to create them quickly, including a good number of ranging options and the ability to use colors and patterns of gradually increasing warmth or density without a lot of work. For line and pin maps, the package should offer a wide variety of point symbols and line styles that let you pack more information on a page. And automated legends and live inset windows, such as those offered by *Atlas*GIS*, can be of enormous help in focusing your audience's attention on details.

PC EDITORS' CHOICE

MAGAZINE • Judgment reserved

Transporting complex applications like geographic information systems to a PC platform is a feat worthy of celebration. These programs will undoubtedly be of great utility to some users, yet when considered as general business applications, none of them are quite up to par. Each has at least one serious handicap that prevents us from giving it an unqualified recommendation.

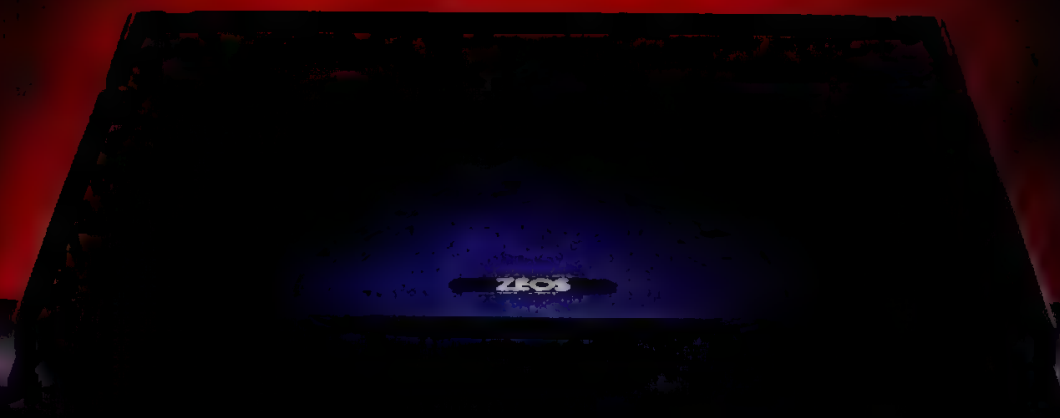
*Atlas*GIS* offers the richest features of the three programs reviewed here. With its abundance of thematic mapping and spatial analysis functions, its ability to tap into .DBF files directly, and its robust address-matching functions, *Atlas*GIS* gives you all you need for creating and analyzing maps. Its interactive WYSIWYG interface shows scales, legends, and even live insets the same way you see them on paper. Unfortunately, the program suffers from extremely slow and unintelligent screen redraws, and its complex menu system—though fundamentally sound—hardly makes it a lucid program to learn or use.

The unique strength of *MapInfo* for Windows lies in its Windows 3.0-based interface, which lets you view several maps with their legends and browse tables displayed on-screen

simultaneously. Its SQL query functions and its ability to read common file formats directly gives it a significant edge in data handling as well. However, the version we tested contained some troublesome bugs, and the program is missing some important mapping features, such as the ability to create proportional fills or symbols and the ability to describe buffer zones around regions, routes, and points.

GisPlus has a few exceptional qualities—notably, extensive routing features and the ability to trace directly over scanned maps and satellite photos. But the software's complex and confusing data preparation requirements, its awkward interface, and its near-total lack of presentation features are crippling handicaps to its use as a general-purpose package. It's not recommended unless the others simply don't fit the bill.

Each of these vendors is planning a significant upgrade, and based on early indications, we can expect them to make some significant improvements in the quality and functionality of their PC-based mapping packages. For now, however, we must reserve final judgment.



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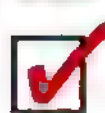
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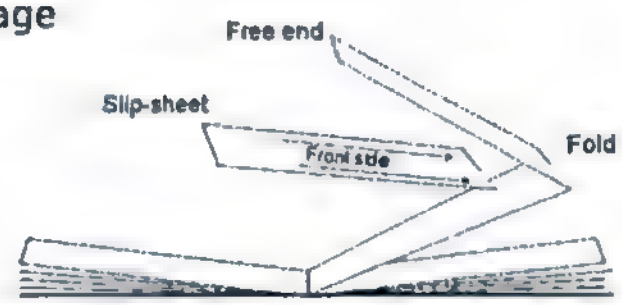
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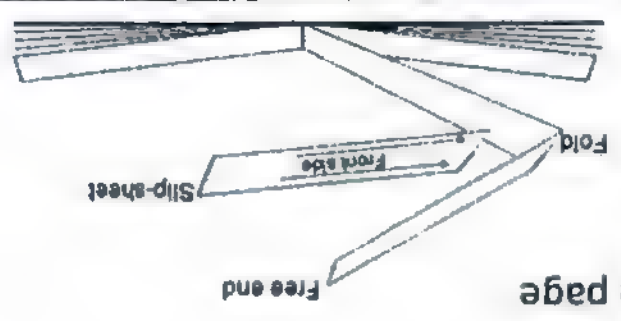
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 1. Front side touching the free page
 2. Arrow pointing to the fold
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4. Close the page and slip-sheet



Foldout slip-sheet



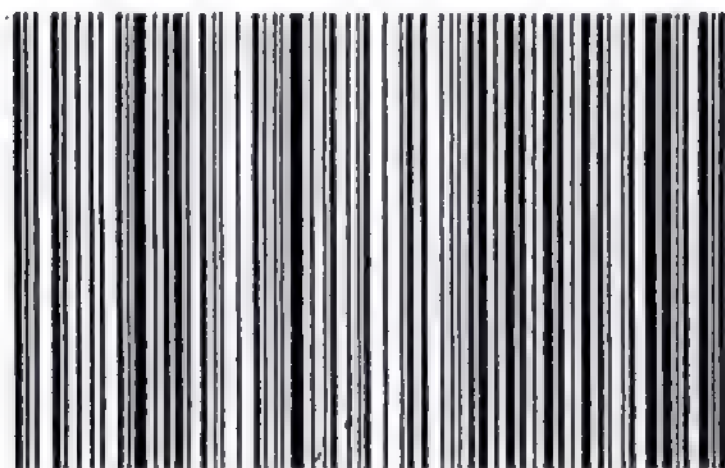
Inverted Foldout slip-sheet



1. Open the foldout page
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Back

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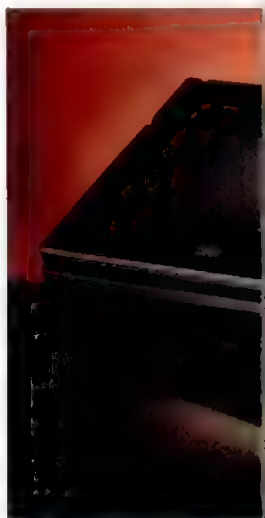
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Reason #2

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In one recent '386 review, *PC Magazine* awarded ZEOS Editor's Choice. "The ZEOS '386 blows away every other computer... a smart choice" is what they said. And in another recent review, *Government Computer News* said the ZEOS 33MHz '386 is "arguably the fastest MS-DOS and OS/2 micro in the world."

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Reason #8

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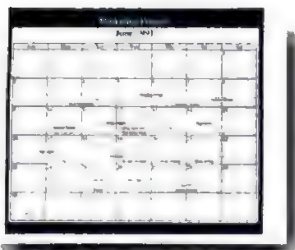
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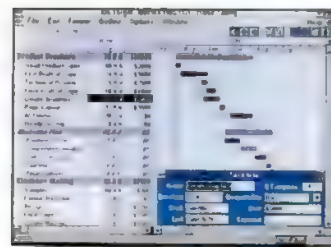
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GRAPHICS MAPPING SOFTWARE

*Atlas*GIS* has much to recommend for presentation output. Its WYSIWYG display shows you exactly what the printed map will look like, with legends, scales, insets, and all other details in their proper positions. It also offers a good range of annotation capabilities, with reasonably attractive fonts. *MapInfo for Windows* doesn't have such a comprehensive page layout system, but it does create simple pie charts and bar charts for use with your maps, and because it's a *Microsoft Windows* program, it supports a very wide range of output devices, including color printers and film recorders.

A DOSE OF REALITY

Although GIS software is no longer the province of specialists, don't be too sanguine: The sheer complexity and scope of these products demands a serious investment in time and commitment. To build an effective geographical database you must be prepared for considerable time and expense, and to use one effectively, you must have a solid knowledge of relational database management as well as a grasp of mapping concepts. In fact, if all you want is to create basic thematic maps, it's worth your while to investigate a simpler program (see the sidebar "Alternative Routes to PC Mapping").

Assuming that you need powerful GIS features, be prepared for the relative design immaturity of the programs. Although they are no doubt vastly better than their minicomputer predecessors, only *MapInfo for Windows*' interface is up to the level of most business software in clarity and consistency.

As you would expect, you should count on a heavy-duty hardware setup. A fast 386 or 486 with a large hard disk (150MB or larger) and several megabytes of memory is indispensable to store and process the vast amounts of data in the average geographical database. Perhaps even more important is a large-screen monitor coupled with a high-resolution video card. Mapping software is one application that really benefits from the extra screen real estate. A math coprocessor can speed up redraws; *GisPlus* even requires one. Many processes are extremely slow even on powerful PCs.

In the future, you can expect to see fancier features on PC-based GIS packages—3-D surfaces, true curves instead of polygons, the ability to translate raster-format maps like aerial photos into vector format automatically, provisions for con-

verting survey results into maps, and some solid spadework on making them easier and faster to use. In the meantime, look at these programs as an opportunity to open up a whole new territory.

Atlas*GIS by Robert Kendall

Strategic Mapping's *Atlas*GIS* goes far to make GIS more accessible to nonspecialized users. For \$2,495, it combines a flair for map presentation with a robust database for an impressive, well-integrated package—albeit one with some performance deficits.

A complete revamp and extension of *Atlas Graphics* (the company's older thematic mapping program), *Atlas*GIS* is based on a fully integrated graphical display similar to a paper map, including the map itself, its scales and legends, and any annotations you might add. You can even create up to two live inset windows, giving you exceptional facility in presenting and highlighting map information that may change. You can click on a map feature to pop up a window with its record and can easily switch between the map and a spreadsheet-like data window to edit the records of selected map features or globally update them using *dBASE*-like expressions.

The program's menus are undeniably complex. Finding some features in the main menu bar can be a guessing game, but fundamentally the menus and prompts are well designed and consistent. Using the program becomes relatively straightforward once you've mastered the underlying concepts. A good tutorial and clear documentation help a lot in taming the beast, though technical support costs \$95 a year after the first 90 days.

*Atlas*GIS* builds maps out of three

Suitability to Task

Atlas*GIS

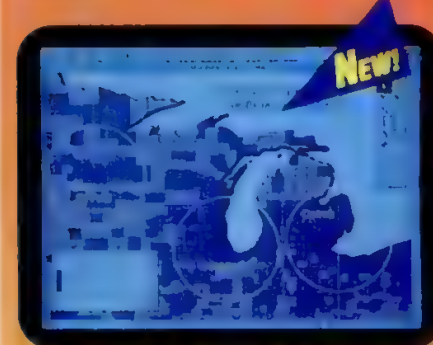
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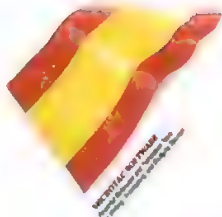
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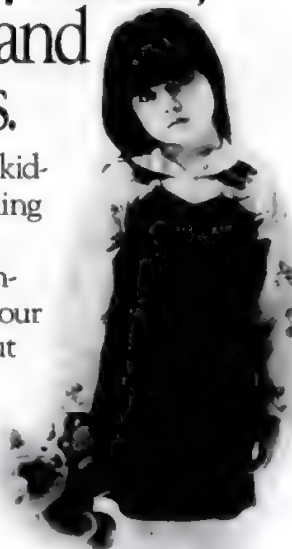
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types of files: a geographical file (containing map features such as the boundaries of regions), an attribute file (containing tabular data linked to map features for thematic mapping), and a data-point file (containing the coordinates of points to be plotted for pin mapping). Only one file of each type may be active at any given time, but you can easily substitute different files of the same type while leaving the others in place. And both the attribute file and the data-point file are in .DBF format, so you can read and write to existing PC databases; the program also imports ASCII files. By the time you read this, *Atlas*GIS* will include a full-featured report genera-



FACT FILE

Atlas*GIS,
Version 1.01
Strategic Mapping
Inc., 4030
Moorpark Ave.,
#250, San Jose,
CA 95117; 408-
985-7400.

List Price:
*Atlas*GIS*,

\$2,495; Import/Export utility, \$495; U.S. county maps, \$95 per state or \$295 for complete set; U.S. ZIP code boundaries, \$250 to \$1,995 per state or \$5,000 for complete set.

Requires: 640K RAM, hard disk, graphics adapter, DOS 3.0 or higher, 1MB expanded memory, VGA graphics adapter, color monitor, and mouse recommended.

In Short: *Atlas*GIS* is a well-rounded mapping tool with strengths in address matching, spatial analysis, and presentation-quality output. Its great complexity is mitigated by a well-designed interface, but its sluggish redraw times make it slow to work with. Copy protected.



CIRCLE 521 ON READER SERVICE CARD

tor for presenting your data in tabular form, and Strategic Mapping is also working on a script language module for building custom mapping applications.

*Atlas*GIS* comes with a generous selection of map files, including world countries and U.S. states and counties (which also show cities and roads), plus attribute files of state, county, and city demographic data. A wide range of additional maps and attribute files, including converted TIGER files, are available from Strategic Mapping at extra cost. You can create your own maps using a digitizing tablet, and a boundary editor within the program lets you edit existing map elements easily. An optional \$495 conver-

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sion utility imports and exports TIGER, Etak, and DIME formats, and also imports AutoCAD .DXF files, although it is rather cumbersome to use.

Before *Atlas*GIS* can use data files for mapping, it must prepare them by designating the fields to link on, duplicating record handling for attribute files, and inserting empty latitude and longitude fields to the data-point files. (Once you've added the latter fields, you can add actual coordinates via a relational join to another .DBF file containing the necessary data.) Fortunately, this is a fairly painless proce-

dures, which happens during import (for ASCII files) or in a separate step (for .DBF files).

*Atlas*GIS* can geocode address records by ZIP code, add county FIPS codes for thematic mapping on county-based data, and even convert between numbers and characters on the fly if the field types don't match. It also excels at address matching in batches or interactively. It matches street intersections and addresses such as "World Trade Center." It can

check ZIP codes or other information to avoid confusion from identically named streets on different sides of town. And if an address is not found, it returns a code that indicates which part of the unmatched address was at fault; you can then relax the match criteria for that part of the address and try again.

QUERIES IN TIME AND SPACE

*Atlas*GIS* is very flexible in selecting and presenting your data. Although it does not support SQL queries, *Atlas*GIS* does allow you to combine Boolean or *dBASE*-

ALTERNATIVE ROUTES TO PC MAPPING

by Rock Miller

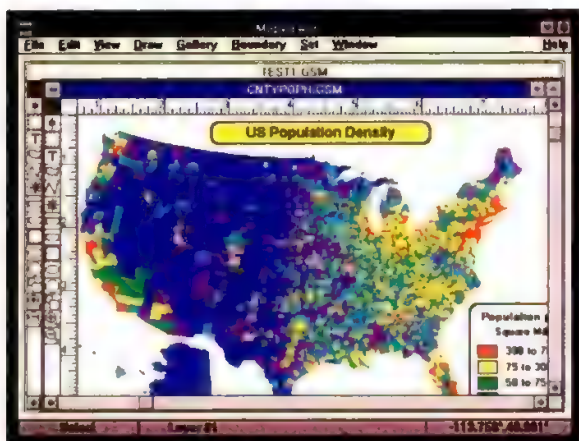
Most of the GISs reviewed in this article let you produce presentation-quality maps from your geographical databases, but many business users don't need the complex layering and address matching features of these programs. Fortunately, a range of simpler mapping options exists.

If you need to create simple thematic maps or plot points generally for presentations, one simple solution is to draw them yourself using clip-art maps. Lotus Development Corp. (Cambridge, Massachusetts) and Arkeo Studios (Riverside, California) offer United States maps that are broken down into counties and other statistically relevant regions. Arkeo and Donnelly GeoSystems (Lancaster, Pennsylvania) also offer world maps, and American Digital Cartography (Appleton, Wisconsin) sells electronic versions of the Digital Line Graph (DLG) maps from the U.S. Geological Survey. CGM is the most common format for these maps, though they are available in .WPG and EPS formats, and bitmapped versions can be found in .PCX and TIFF formats.

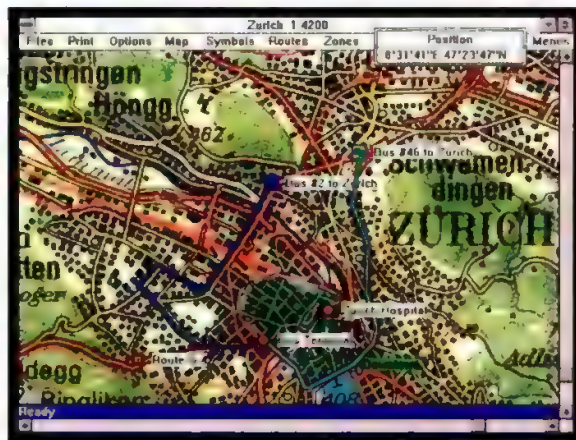
The big advantage of using clip art to create thematic maps is the control it gives you over the artistic results. You can detach individual regions or regroup them into larger regions of your own choosing, and with a drawing program such as *CorelDRAW* or *Arts and Letters Graphics Editor*, you can use subtle colors and details unattainable in most mapping packages. The flip side is that this is a labor-intensive procedure, and since the maps are not linked to their underlying data, updating them is a lot of work.

MAPPING AIDS

If you are pressed for time, a presentation mapping program such as the \$395 *Harvard Geographics* from Software Publishing Corp. (Mountain View, California) excels at creating simple thematic maps quickly from worksheet files. Based on a proprietary map database, it includes Sectional Center Facilities (aggregate three-digit ZIP code regions) as well as U.S. states and counties, which can be grouped into custom sets. The *Harvard Geographics*-like interface is a little awkward, but it gives you a good choice of range options, plus tools for creating legends, titles, and text annotations. And since it uses *Harvard Graphics*' palette and symbol files, you can easily incorporate the completed maps into your presentations. You're limited to using only the maps that come with the package, and these



If you don't need all the power of a GIS, special-purpose mapping features can fill the bill with less complexity. *MapViewer* (above), for instance, produces a rich variety of thematic maps and supports all of *Microsoft Windows*' extensive color and font options. *Mapix* (right) lets you plot points and lines as overlays on scanned maps whose coordinates are interpolated from the map projection.



GRAPHICS MAPPING SOFTWARE

style selection criteria along with spatial conditions such as finding points within or near regions or routes. This can be an extremely powerful way to work; for example, you could select all your stores that have been in operation for five years and that are within two miles of a school.

*Atlas*GIS* also has potent features for manipulating geographical regions; you can create new regions by combining or intersecting existing regions, or combine multiple points into one that represents the center of the original cluster. Any linked data is aggregated automatically.



are Mercator projections, which tend to look distorted on areas of continental size. But overall, *Harvard Geographics* is a solid and useful tool for its purpose.

If you need more analytical flexibility, you can move up to a more robust thematic mapping package. The best in this category are almost as powerful as a GIS in their own realm; they understand coordinates, so you can plot your own point files, and they may even support multiple map projections and layers. All they lack is the address matching and additional spatial analysis features that distinguish a true GIS.

Atlas Graphics (\$495) from Strategic Mapping (San Jose, California) produces hatch or dot-density maps, point maps (with a limited selection of symbols), and line or route maps, though only on a single layer. It uses the same map files as its heftier cousin, *Atlas*GIS*, and you can add your own maps relatively easily by using its built-in boundary editor or its more-powerful companion program, *Atlas Draw* (also \$495). Unfortunately, its dual-floppy-disk, CGA-era design seems painfully archaic. It doesn't support PostScript output or Super VGA video, and its multimodule design and static map display (which doesn't even support a mouse) are clunky.

A far better choice for thematic mapping is the *Microsoft Windows 3.0*-based *MapView* from Golden Software (Golden, Colorado). Built around a convenient gallery of map types, this \$295 program can produce maps with proportionally sized symbols or pie

charts in each region, or 3-D "prism" maps in which height is proportional to data value, as well as the usual hatch and dot-density maps. It can also plot points, although the procedure is far from straightforward, and only size—not color or style—can be controlled by the data.

MapView's multilayered point-and-click interface makes laying out and changing legends and annotations a snap; there's a full range of drawing tools, and you can use as many fonts and colors as *Windows* allows (though its color palette box, which is buried in the menus, could be improved in design). A full range of U.S. state and county maps are shipped with the package, and you can download ZIP code regions and a full set of DLG maps at no charge from the company's bulletin board (they can be acquired by mail for \$20 per floppy disk). You can import map files in *Atlas* or *.DXF* formats, and an upcoming version will support DLG maps on CD-ROM.

DIFFERENT STROKES

Mapix, from Hyperdyne, takes the opposite tack; instead of thematic mapping, it plots points and routes. It does not use vector map files defined by latitude and longitude coordinates. Instead, it uses scanned images of maps on which you plot points and lines as overlays. Since scanned maps don't have any geographical information initially, you must first geocode them by identifying the real-world coordinates of the diagonal corners; *Mapix* then interpolates the coordinates of each

(Aggregation options are extensive and include weighted averaging.)

Initially, attribute and data-point files are stored on their own layers, which are separate from the layers that compose the map. But you can easily create new map layers and move features from one layer to another. For instance, you might transfer individual records from your data-point file into a new layer of your geographical file, creating a multilayer pin map. Of course, you can easily turn individual layers on and off as you desire, and you can set scaling thresholds to make

pixel from the projection on which the original map was based. You can tile maps together to cover larger areas and group several sets of tiled sheets at different scales into map sets to simulate zoom levels.

As a product, *Mapix* fails to fulfill the promise of its innovative roots. The latest version has a powerful script language that lets you automate any *Mapix* operation via DDE macros; perhaps for this reason it has no data management functions of its own. In any case, its menu-operated functions are anemic. You can plot point files, and you can place points, plot routes, or shade regions simply by tracing over scanned maps. But you can't make the point shape or color reflect the underlying data (except manually), and you can use only six colors for routes or regions. Unfortunately, you have no control over the placement of point and region labels, and *Windows* fonts are not supported.

Mapix's reliance on scanned maps imposes further drawbacks. Screen update times are very slow despite its image cache option. Though you can measure distances on-screen, the minimum granularity is 1 pixel, so accuracy depends on the scale of the map. And you can export completed maps only by printing them to disk as bitmapped *.PCX* files. The program is copy-protected with a hardware key, and its list price of \$1,795 is high for a product that is good for little more than creating pretty pictures. For most users, it's at best an intriguing technology in search of a better implementation. ■

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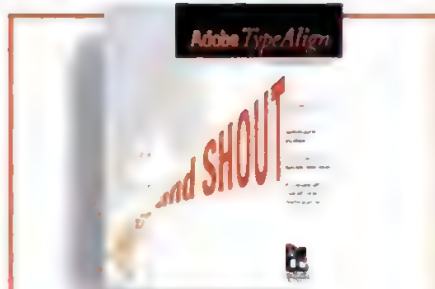
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9490	□ Harvard Graphics 2.3	329.
	□ Harvard GeoGraphics	269.
	Software Toolworks ... NCP	
9859	□ Word for Word (Windows version)	47
	Solution Systems ... NCP	
7977	□ Brief 3.1 (Programmer's Editor)	189.
	Spinnaker ... NCP	
7604	□ PLUS for Windows 1.0	289.
	Symantec ... NCP	
6397	□ The Norton Backup 1.2	105.
3146	□ The Norton Utilities 5.0	119.
3425	□ Q&A 3.0	239.
7999	□ Norton Anti-Virus 1.0	89.
	Systems Compatibility ... NCP	
8215	□ Outside In 2.0	85.
6564	□ Software Bridge 5.0	79.
	Teleware ... NCP	
9847	□ M.Y.O.B. for Windows	139
	TIMESLIPS ... NCP	
2987	□ Timeslips III 4.0	195.
6994	□ PercentEdge 1.0	69.
1270	□ TimeSheet Pro 2.0	145.
	Timeworks ... NCP	
6253	□ Publish-It! 1.2	139.
	T/Maker ... NCP	
1051	□ Color Graphics Presentation 1.0	95.
	□ ClickArt (EPS and Bitmap available)	call



TIMESLIPS ... NCP

1270 □ **TimeSheet Professional 2.0**—Track your time and expenses using a familiar spreadsheet entry format. TimeSheet Pro is designed for the project-oriented professional. Customized reports. (network version available) ... \$145.

	Touchstone Software ... NCP	
7420	□ Check It 3.0	\$89.
	Traveling Software ... NCP	
5179	□ LapLink III 3.0	95.
	Ventura Software (Xerox) ... NCP	
7796	□ Ventura Publisher for Windows 3.0	569
	West Lake Data Corporation ... NCP	
7577	□ PC-FullBak+ 2.0	52.
	WordPerfect Corporation ... NCP	
7781	□ LetterPerfect 1.0	129.
3804	□ WordPerfect 5.1	265.
6685	□ DrawPerfect 1.1	279.
	WordStar International ... NCP	
6791	□ WordStar Prof. 6.0	199.
	XTREE ... NCP	
6161	□ XTree Gold 2.0	95.

RECREATIONAL/EDUCATIONAL

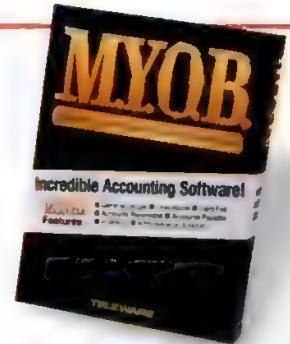
	Broderbund ... CP	
8068	□ Where in the World is Carmen Sandiego Deluxe Edition	52.
5851	□ SimCity	33.
8886	□ SimEarth	45.
	Electronic Arts ... NCP	
4534	□ Mavis Beacon Teaches Typing (CP)	35.
7865	□ PGA Golf	35.
	Harvard Associates ... NCP	
2324	□ IPC Logo 3.0	59.



Microcom ... NCP

6234 □ **Carbon Copy Plus 6.0**—All the PC and LAN remote control, file transfer and terminal emulation software package you'll ever need. Supporting: DESQView 386, QEMM-386 and 386MAX ... \$119.

	Microsoft ... NCP	
7881	□ Entertainment Pack for Windows 1.0	29.
2858	□ Flight Simulator 4.0	42.
8270	□ Aircraft and Scenery Designer 1.0	29.
	Microsoft Press (Books)	
8129	Running Windows (2nd Edition)	22.
8136	Running Microsoft Excel	22.
	Penton Overseas ... NCP	
	□ Vocabulary Levels I & II (French, Italian, German, Spanish, Russian, Hebrew and Japanese)	each 35.
	Sierra ... CP	
8146	□ Quest for Glory II	39.
9466	□ Space Quest IV (VGA)	39.
7972	□ King's Quest V (VGA)	45.
	SirTech ... CP	
8235	□ Bane of the Cosmic Forge	39.
	Software Toolworks ... NCP	
4659	□ Chessmaster 2100 (CP)	35.
7372	□ World Atlas	42.
	Spectrum Holobyte ... NCP	
3467	□ Tetris	22.
	Stone & Associates ... NCP	
5231	□ Phonics Plus 1.1	22.
7564	□ Young Math 2.2	22.
	SubLogic ... NCP	
6190	□ Air Transport Pilot	39.



Teleware ... NCP

9847 □ **M.Y.O.B. for Windows**—Incredible Accounting Software for Windows. M.Y.O.B. contains full-featured G/L, A/R, A/P, Inventory and Card file. The hottest selling program for the Mac is now available for PC users ... \$139.

	Toyogo ... NCP	
7674	□ Nemesis Go Master 4.7	41.
7676	□ Nemesis Go Master Deluxe 4.7	88.
	True BASIC, Inc. ... NCP	
	□ Kemeny/Kurtz Math Series	each 45.

HARDWARE

Warranties listed next to manufacturer.

	Acme/SAFE Power Systems ... 2 years	
6747	Safe 400S	399.
	American Power ... 2 years	
7108	Smart UPS 400	339.
7105	Smart UPS 600LS	469.
6811	Back-UPS 360SX	219.
7106	Back-UPS 520ES	329.
	AST Research ... 5 years	
1299	SixPakPlus 384k C/S/P	179.
8041	SixPak 286 0k	99.
	ATI Technologies ... 2 years	
9821	VGA Basic (640 x 480, 16 colors)	85.
9985	VGA Integra (1024 x 768, 64 colors)	129.
9629	VGA Wonder XL (256K upgradable to 1MB)	199.
9619	8514/Ultra Graphics Card (512K) (req. VGA)	419.
9819	2400etc/e Modem	199.
9620	9600etc/e Modem	499.
	Boca Research ... 5 years	
7001	BOCARAM/AT PLUS (0-8 Meg)	119.
7061	BOCARAM/XT OK (0-2 Meg, LIM 4.0)	99.
6998	I/O Board for AT	59.
6999	I/O Board for Microchannel (S/S/P)	109.
8380	BasicVGA (256K, 640 x 480)	69.
8381	SuperVGA (1 Meg, 1024 x 768)	145.
	Bravo Communications ... 2 years	
7400	2 Position Laser Compatible Switch Box	109.
	Brown-Wagh ... 1 year	
8578	Creative Labs Sound Blaster	159.
	Canon ... 1 year	
7894	BJ-10e Printer with free case (4.6 lb.)	329.
7897	BubbleJet Ink Cartridge (BJ-10e)	23.
9037	BJ-300 Printer (80 column)	549.
9038	BJ-330 Printer (136 column)	649.
9828	BubbleJet Ink Cartridge (BJ-300 & BJ-330)	26.
	CH Products ... 1 year	
7801	FlightStick w/Falcon	49.
8119	FlightStick w/Falcon & GameCard III	79.
7345	Rollermouse (Trackball) serial	85 bus 99.
	CoStar ... lifetime	
6091	The Organizer (mobile storage cart)	199.
7453	The Organizer Jr.	82.
	Curtis ... lifetime	
9756	Keyboard Space Saver II KS-2	39.
1708	Ruby-Plus SPF-2	65.
7358	Command Center SPF-4	89.
	Glass Filter Plus (specify size)	each 65.

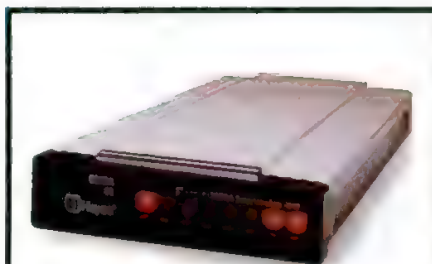
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Quarterdeck ... NCP
3221 ☐ Expanded Memory Manager 386 5.1-
Finds up to 200K of "hidden" memory in
your PC and manages Expanded or Extended
memory. A must-have for memory-hungry
software, networks or Windows 3.0 ... \$65.

Cyrix Corporation ... 5 years		
MATH COPROCESSORS		
9875	83D87-25.....	379.
9876	83D87-33.....	459.
9877	83S87-16 (SX compatible).....	249.
Datadesk ... 3 years		
6901	Switchboard.....	175.
Epson ... 2 years		
We are an authorized Epson Service Center.		
1906	FX-850 (80 col., 264 cps, 9 pin).....	call
1904	FX-1050 (136 col., 264 cps, 9 pin).....	call
5183	LQ-510 (80 col., 180 cps, 24 pin).....	call
1930	LQ-850 (80 col., 264 cps, 24 pin).....	call
1917	LQ-1050 (136 col., 264 cps, 24 pin).....	call
5184	LX-810 (80 col., 180 cps, 9 pin).....	185.
Everex ... 1 year		
1348	Tempo LX Notebook (1 Mb upgr. to 5 Mb).....	2399.
Hauppauge Computer ... 1 year		
9031	20 MHz 386 Motherboard for PC.....	995.
9032	20 MHz 386 Motherboard for XT.....	995.
9870	25 MHz 386 Motherboard for AT.....	995.
9034	33 MHz 386 Motherboard for AT.....	1399.
Hayes ... 2 years		
2307	Smartmodem 2400.....	349.
7391	Ultra 96 Modem.....	669.
9884	Pocket Edition 2400.....	129.
Hewlett-Packard ... 1 year		
9993	LaserJet IIIP (with toner).....	1149.
6754	LaserJet III (with toner).....	1699.
Hitachi ... 2 years		
9492	CM1483M 14" SVGA Monitor (1024 x 768).....	599.
9491	CM2085M 20" SVGA Monitor (1280 x 1024).....	1995.
Intel ... 5 years		
6421	2400B MNP Internal Modem.....	199.
5119	2400 Baud External Modem.....	179.
6420	2400EX MNP Modem.....	229.
7880	9600EX Modem.....	549.
2348	Inboard 386/PC with 1 Meg.....	495.
5336	Above Board Plus 8 2 Meg.....	449.
5342	Above Board Plus 8 I/O 2 Meg.....	479.
7782	SatisFAXtion (fax board).....	399.
8778	SatisFAXtion for Microchannel.....	449.
8901	Matched Memory 2 Meg (PS/2).....	139.
8903	Matched Memory 4 Meg (PS/2).....	325.
MATH COPROCESSORS		
7385	80287XL (16 MHz 80286 CPU's).....	199.
4750	80387SX (16 MHz 80386SX CPU's).....	309.
2372	80387-20 (20 MHz 80386 CPU's).....	399.
4121	80387-25 (25 MHz 80386 CPU's).....	499.

Kensington Microware ... 1 year		
2582	Master Piece Plus	\$99.
7899	Expert Mouse serial . 119. 7900 bus .	129.
Key tronic ... 3 years		
4518	101 Plus Keyboard	99.
Kraft ... 5 years		
5800	3 button Thunder Joystick	29.
5813	Game Card/Thunderstick Bundle.	55.
7862	TopTrak (Laptop Trackball)	75.
Logitech ... limited lifetime		
6029	Trackman serial. 85. 6028 bus.	89.
7975	ScanMan 256.	319.
8694	MouseMan (serial)	69.
9766	MouseMan (cordless).	139.
Megahertz ... 5 years		
1199	T52CC (2 Meg) (Toshiba T1000SE/XE) .	239.
1193	T324D 2400 Modem (for Toshiba Laptops)	129.
1196	T224 2400 Modem (for Toshiba Laptops)	129.
1187	T324FM 96/24 Fax Modem (Toshiba Lptps.)	299.
Micron Technology ... 2 years		
7595	2 Meg Expansion for HP LaserJet IIP or III.	119.
7012	Memory Upgrade PS/2 70 - 2 Meg.	149.
Microsoft ... lifetime		
7597	Microsoft Mouse	89.
2897	Mouse with Paintbrush	105.
2898	Mouse with Windows 3.0	149.



Hayes ... 2 years
7391 Ultra 96 Modem—Get ultra high modem
performance & error control without sacrificing
compatibility. Supports CCITT V.32, V.42bis,
Express 96, MNP Level 2-5, & standard
2400/1200/300 bps communications .. \$669.

MicroSpeed ... 1 year			
PC-TRAC Trackball			
6007	serial	75. 6008 bus	89.
7271	Inport	79. 6330 PS/2	79.
Mouse Systems ... lifetime			
5997	Trackball (1 yr. wrnty.) serial ..	65. bus ..	69.
7878	PC Mouse III (bus or serial)	89.	
NEC ... 2 years			
9441	CDR36 Portable CD-ROM Drive	399.	
4799	Multisync 2A (VGA Monitor)	499.	
5085	Multisync 3D Monitor	689.	
Orchid Technologies ... 4 years			
7863	ProDesigner VGA IIS with 1 Meg	329.	

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1326 HP LaserJet III & Pacific Page XL Bundle—
High-speed PostScript solution! You get the top
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PC Power & Cooling ... 1 year		
REPLACEMENT POWER SUPPLIES		
3203	Turbo Cool 200	149.
7915	Turbo Cool 300	165.
3200	Silencer 150 (84% noise reduction).	115.
7053	InnerSource 2210 (power backup)	349.
Pacific Data Products ... lifetime		
6779	25 Cartridges in One! (for LJ II, IIP, III)	275.
8816	PacificType (40 PostScript Typefaces for Pacific Page PE 4.0 users)	275.
8975	Complete Font Library (for LJIII)	275.
Memory upgrade for LaserJet IIP/III:		
7055	2 Meg 149. 7759 4 Meg	279.
Memory upgrade for LaserJet II/IIID:		
6838	2 Meg 249. 6836 4 Meg	379.
7158	Pacific Page PE 4.0 (for LJ IIP/III)	379.
6834	Pacific Page with free 2 Meg Memory Board (for LaserJet II)	379.
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Intel ... 5 years
80387 Math CoProcessors—Get the most out of
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spreadsheets, database, CAD, graphics and
font programs see line listings.

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3103	2400 Baud Internal Modem	\$129.
3102	2400 Baud External Modem	179.
8993	2400 Baud Internal Modem (V.42 bis)	169.
8994	2400 Baud External Modem (V.42 bis)	209.
4542	2400 Baud Internal Modem for PS/2	229.
8132	PM2400 Pocket Modem	109.
7934	PM9600SA Modem	489.

Targus ... lifetime

4900	Lappac 2 Carrying Case (Horizontal)	55.
6037	Premier Leather Carrying Case	179.

TheComplete PC ... 2 years

5828	TheComplete Communicator	449.
9758	TheComplete Flatbed Scanner	995.
9760	TheComplete Page Scanner with Calera's Word Scan	619.

Toshiba ... 1 year

9893	T2000SX Notebook (40 Meg)	call
9894	T1200XE Laptop (40 Meg)	call

Tripp Lite ... 2 years

6199	Isobar 4-6 (4 outlets, 6 ft. cord)	49.
6200	Isobar 6-6 (6 outlets, 6 ft. cord)	59.
9826	BC375 (375VA Battery Backup)	219.
9312	BC500 (500VA Battery Backup)	269.

Video 7 ... 7 years

4931	VRAM II VGA 512k	349.
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Zoom Telephonics ... 7 years

1307	2400 Baud w/9600 Baud Fax Modem	129.
1181	2400 Baud V.42bis Modem	159.



Plus Development ... 2 years

8287 Hardcard II XL 105 Meg (9 ms)—Add a super fast 105 Meg hard drive to any 286/386 system. Anyone can install it in minutes. Takes up only one 16 bit slot. New low price \$599.

DRIVES

CD Technology ... 1 year

8057	Porta-Drive CD-ROM	649.
8105	Installation Kit for Standard Bus	155.
8106	Installation Kit for Microchannel	249.

Conner Peripherals ... 1 year

8875	CP3044 40 Meg IDE HD (25 ms)	325.
8874	CP3184 80 Meg IDE HD (25 ms)	499.
8876	CP3104 100 Meg IDE HD (25 ms)	549.

IONEGA ... 1 year

5116	Bernoulli II 44 Meg Internal	829.
7551	Bernoulli II Transportable 44 Meg	929.
5113	44 Meg Cartridge Tripak (5 1/4")	269.
2500	PC2B Controller	209.

Mountain Computer ... 2 years

2917	40-60 Meg Internal Tape Drive	259.
5500	83-152M Internal Tape Drive	629.
5190	DC2000 Pre-formatted Cartridges	ea. 35.
6153	DC2120 Tape Cartridge (5 pack)	149.

Pacific Rim ... 1 year

1304	1.2 Meg External (for any parallel port)	265.
6802	1.44 Meg External (for PC/XT/AT)	239.

Plus Development ... 2 years

8304	Hardcard II XL 50 Meg (9 ms)	399.
8287	Hardcard II XL 105 Meg (9 ms)	599.

Seagate ... 1 year

4554	40 Meg Internal HD ST251-1 (28 ms)	\$269.
1321	ST157A 40 Mb IDE Hard Drive	239.
1320	ST1144A 130 Mb IDE Hard Drive	499.

TEAC ... 1 year

4670	1.44 Meg Drive for PC/XT (3 1/2")	79.
4326	1.44 Meg Drive for AT (3 1/2") with Bastech software	99.
4951	720k Drive for PC/XT (3 1/2")	69.
6951	1.2 Meg Drive for AT (5 1/4")	89.

DISKS/MEDIA

Maxell ... lifetime

2789	5 1/4" MD2-D 360k Disks (Qty. 10)	10.
2790	5 1/4" MD2-D 1.2 Mb Diskettes (Qty. 10)	15.
2792	3 1/2" DS/DD 720k Diskettes (Qty. 10)	13.
2793	3 1/2" DS/HD 1.44Mb Diskettes (Qty. 10)	21.



Everex ... 1 year

1348 Tempo LX Notebook Computer—16 MHz 80386SX with 1 Meg of Ram upgradable to 5 Meg. 6.9 lbs. including Nicad battery. 1.44 Meg Floppy and 21 Mb IDE hard drive. MS DOS 4.01 Great machine. . . \$2399.



Canon ... 1 year

7894 BJ-10e Bubblejet Printer—Light weight, excellent print quality and a great price make this 4.6 lb. printer a winner. Choice of black or white. Optional sheet feeder \$329.

Sony ... lifetime

3291	5 1/4" DS/DD 360k Disks (Qty. 10)	9.
3297	3 1/2" DS/DD 720k Diskettes (Qty. 10)	12.
3298	3 1/2" DS/HD 1.44Mb Diskettes (Qty. 10)	19.
6148	3 1/2" DS/DD (3 Pack)	29.
6375	3 1/2" DS/HD (3 Pack)	49.
8185	QD 2040 Tape Cartridge	19.
3M ... lifetime		
3943	DC 2000 Tape Cartridge	20.
6065	DC 2080 Tape Cartridge	25.
3944	DC 600 Tape Cartridge	29.
5679	DC 6150 Tape Cartridge	29.

MEMORY

6556	256k DRAM (100 ns, set of 9)	call
5510	1 Meg x 9 SIMMs (80 nanosecond)	call
5746	1 Meg Chips (80 ns, set of 9)	call
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Practical Peripherals ... 5 years

7934 PM9600SA Modem—Practical Peripherals does it again by making communications affordable with their newest modem featuring the data compression & error correction of 9600bps V.32 & V.42bis operation \$489.

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- Hawaii:**
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- Alaska and outside Continental US:**
- Call 603/446-7721 for information.



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GRAPHICS MAPPING SOFTWARE

them invisible at certain zoom levels.

For thematic and pin mapping, *Atlas*GIS* offers just about every option you could want. You can create thematic maps based on variables, though you are limited to two variables and two layers in this case. You can make the density of the colors or fill patterns proportional to your data values on thematic maps and make the size of symbols or the thickness of a line map proportional to the data values as well. You can produce variable-determined representations of two layers in your geographical file or of one geographical layer and your datapoint layer. Alternatively, you can create a bivariate map of a geographical layer or the datapoint layer, but not both.

*Atlas*GIS*'s integrated display makes it a good tool for creating presentation-quality maps. For pin maps, there are 93 different symbols to choose from, and you can assign a huge range of colors and fill patterns to data ranges or values in thematic maps. In addition to a rich variety of legend, scaling, and inset options, which you can position or resize interactively with the mouse, you can add text annotations anywhere you want, although the fonts are designed for use with plotters and look crude on a laser printer. You can use just about any type of output device except film recorders; the Hewlett-Packard LaserJet III and color PostScript output look excellent.

*Atlas*GIS*'s overall flexibility, however, is counterbalanced by its slow screen

performance. Every time you change one criterion, the program recalculates the entire range. If your new map is large and requires more than one new ranging criterion, this can mean 5 or 10 minutes of waiting for needless recalculations. Creating a new thematic or pin map from the same data also necessitates a time-consuming redraw, making it unsuitable for quick queries.

*Atlas*GIS* demonstrates that a GIS can fit comfortably into a business computing environment. It combines powerful features with an accessible though complex mouse-driven interface. Its link to other business applications via *dBASE* and its support for a wide array of output devices make it a good choice for most users. If its redraw performance could be brought up to an acceptable level, this package would be a winner.

GisPlus by Paul Murphy

It would seem that a package offering as many features as Caliper Corp.'s *GisPlus* could fulfill the needs of a broad spec-

trum of users. However, it falls short of this goal in its implementation. The \$2,995 program does handle thematic mapping and spatial analysis functions and is notable for its extensive routing support, but its awkward data handling and difficult interface make it less than ideal for most purposes.

In *GisPlus*, you work with applications composed of a maximum of 40 point, line, and area databases. For instance, you can keep separate applications for each sales region, with a database of state and county boundary information, road and highway data for transportation, and client addresses. Unfortunately, the

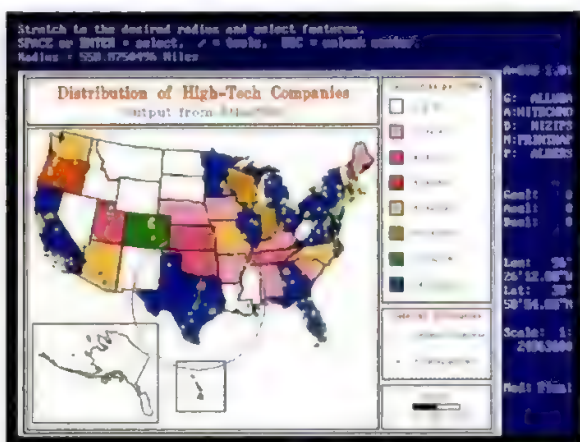


***GisPlus* lets you import and trace aerial or satellite photos over your scanned maps. This makes it easier to update your geographical database to match the real-world changes that occur over time.**

only way to open existing applications is from the DOS prompt. Although you can create a new application from within the program, there's no facility for browsing through a list of applications or opening another one.

Unlike its competitors, *GisPlus* uses a proprietary database format, which requires all files to be prepared using a separate *GisBuild* module. This module is used to define the type of database (point, line, or area database), assign names for the layers, and supply information about its fields. All data must be in comma-delimited or fixed-format ASCII files; you can't import .DBF or .WK1 files. You must choose which fields you want to index at the start or you'll have to rebuild the database to add a key field later. Indexing can take a lot of time; during our testing, an 8,500-record database that took just 4 minutes to build with one key field took over 3 hours to build with five key fields.

GisPlus is better when it comes to preparing map files. Vector maps containing boundary, town, and highway information for New York state and TIGER data for Manhattan are included with the package. Unlike the other vendors, Caliper makes high-resolution maps of the entire United States (available to registered *GisPlus* users free of charge), which include state and county boundaries, highways, three- and five-digit ZIP code regions, and population data for cit-



***Atlas*GIS* gives you many alternative methods of performing spatial queries. You can select all points within a given radius simply by drawing a circle on the map.**

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CIRCLE 384 ON READER SERVICE CARD

DIGITAL MAPS AND WHERE TO GET THEM

by Paul Murphy

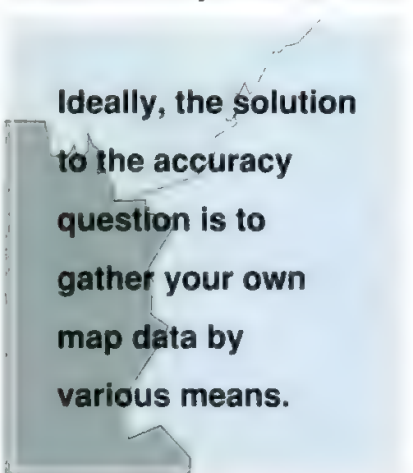
As any culinary artiste can tell you, the basis for a great soup is the stock, and the stock of geographic information systems consists of accurate maps. Map files, which are essentially ASCII data files containing the coordinates of geographical features and tabular data linked to those features, are widely available from the Federal government or private vendors. But the maps aren't always up to date, and true accuracy comes at a price.

The primary source of map files in this country is TIGER (Topographically Integrated Geographical Encoding and Referencing), a system developed by the U.S. Bureau of the Census in cooperation with the U.S. Geological Survey. Originally intended to aid in the deployment and recording of the 1990 Census, this system is invaluable to GIS users as a ready source of base maps and address-matching data.

The physical maps within TIGER files are derived from the U.S. Geological Survey's 1:100,000-scale Digital Line Graph (DLG) maps, and include roads and waterways as well as region boundaries. Tract information, address codes, ZIP codes, and raw census data from the Census's GBF/DIME (Dual Independent Map Encoding) files are then added to this physical map, resulting in a topological file of every street, block, and address in the United States.

You can purchase TIGER files for any county in the United States from the Customer Services Branch of the Data User Services Division at the Bureau of the Census in Washington, D.C. (301-763-4100). The cost is \$175 per state plus \$25 for each county. Unfortunately for PC users, the complete files are available only on nine-track tape, though they are gradually becoming available on CD-ROM. Consequently, you may need to consult your GIS vendor to get these maps; most offer selected TIGER files (at a cost premium that can be considerable) translated into their native format on PC media.

If all you need is geography, the DLG maps are also available separately, for the entire United States at 1:2,000,000 and 1:100,000 scales and for limited areas in a much more detailed 1:24,000 scale. You can order DLG files directly from the U.S. Geological Survey in Virginia (703-648-6892); the first map costs \$40, each ad-



Ideally, the solution to the accuracy question is to gather your own map data by various means.

ditional map (up to five maps) is \$20, and a package of six or more maps costs \$90 plus \$7 for each individual map. Like TIGER files, DLG files are shipped on nine-track tape in ASCII format, and they are also starting to become available on CD-ROM.

QUESTIONABLE ACCURACY

If you require strict geographical accuracy, however, TIGER files will be less than fully adequate. Inaccuracies are introduced at several stages in the translation process. USGS topographical maps, originally drawn at 1:24,000 scale, are digitized at 1:100,000 scale, and the equipment that is used to digitize the original maps isn't always able to scale them with consistent accuracy.

Moreover, there are no common relational links between the DLG files and GBF/DIME files, so the process of integrating map and data can be a source of more errors. Finally, the demographic information provided within the files is only as up-to-date as the last census.

Ideally, the solution to the accuracy

question is to produce your own maps. You can gather map data by traditional field surveys, by aerial reconnaissance methods, or by using GPS (Global Positioning System) devices, which generate accurate cadastral coordinates through the NAVSTAR satellite network. Unfortunately, rolling your own in this way is extremely expensive—running approximately \$20 to \$25 per parcel.

An alternative method, popular among municipalities on limited budgets, is to start with TIGER files or digitized versions of tax assessment maps, and then retrofit them to a more accurate system of plane coordinates gathered from survey data. This allows you to enjoy the immediate benefits of a preformatted geographical database, but you'll still need to improve the accuracy of your land and property data over time as needed.

A faster if not costlier road to better maps is to turn to one of the third-party vendors who have made a retail business of improving the accuracy of government map files. The U.S. county maps from Etak (Menlo Park, California), for instance, start out as DLG files, but Etak boosts their accuracy by checking each feature in the database for topological and geometric consistency. The results, which come in ASCII format for use with a variety of GIS systems, have the coordinate accuracy and street network content of 1:24,000-scale USGS quad maps.

Unfortunately, this accuracy comes at a considerable markup; their cost ranges from \$1,000 for a small county to \$5,000 for a large one like Los Angeles County. Similar maps are available from Donnelly GeoSystems (717-393-8806), which also offers a range of custom services including map digitization.

A GIS is only as good as its data files. Since the components that make up a GIS are as diverse in accuracy as they are in content, it's up to you to ensure that your geographical database matches its intended use in flexibility and accuracy. ■

GRAPHICS MAPPING SOFTWARE

MAPPING SOFTWARE: SUMMARY OF FEATURES

Products listed in ascending price order

	MapInfo for Windows	Atlas*GIS	GisPlus
	\$995	\$2,495	\$2,995
THEMATIC AND PIN MAPPING			
Ranged-fill types:			
Quantiles	■	■	■
Equal proportions	■	■	■
Percentiles	□	■	■
Standard deviations	□	■	■
Bivariate	□	■	■
Expression-based	■	■	□
User-defined values	■	■	■
Proportional fill	□	■	□
Dot-density fill	□	■	■
Pin mapping:			
Ranged symbols	■	■	■
Proportional symbols	□	■	■
Ranged lines	■	■	■
Separate data-point files	■	□	□
Summary statistics	□	■	■
Maximum number of thematic variables	Unlimited	2	14
SPATIAL ANALYSIS			
Address location	■	■	■
Locate features:			
By pointing/by coordinates	■ / ■	■ / ■	■ / ■
Within radius/within region	■ / ■	■ / ■	■ / ■
Distance expressions:			
Fixed distance	■	■	■
Variable (expression-based)	□	■	■
Buffer (range of influence)	□	■	■
Distance measurement	■	■	■
Routing	□	□	■
MAP DISPLAY AND WORKSPACE MANAGEMENT			
Zoom:			
Fixed zoom/zoom box	■ / ■	□ / ■	■ / ■
To scale/within range of feature	■ / ■	■ / ■	■ / ■
Undo zoom	■	■	■
Pan/rotate	■ / □	■ / ■	■ / □
Layer management:			
Displays layers individually	■	■	■
Displays layers according to-map scale	■	■	■
Creates layers by data operations	■	■	■
Creates layers by polygon intersection	□	■	■
Overlays layers from different files	■	■	■
Customization:			
Macros	□	■	■
Programming language	□	□	■
Customizable menus	□	□	■

■—Yes □—No

ies and towns. GisBuild also imports raw TIGER files and translates them into its proprietary format so that you can buy them directly from the government. Another unique benefit of *GisPlus* is its ability to display raster files (such as .PCX files of scanned paper maps or aerial/satellite photos in EOSAT or SPOT format) as a background for tracing with a mouse or digitizing palette. This can be a relatively inexpensive way to update your existing coordinate base, compared with conventional surveying techniques.

GisPlus can perform geocoding by ZIP code matching or by address matching. But be forewarned: To use the address-matching facility, you must first make sure the addresses in your data file are parsed into three separate fields (number, street, and type). There's no facility within *GisPlus* to do the parsing, so if your data is not in this form, you'll have to use another application or write a program to parse it yourself.

ADVANCED FUNCTIONS

Once you've built your applications, *GisPlus* gives you a good range of functions for selecting and manipulating data. Its spreadsheet-like data editor gives you what you need to aggregate data, even between databases. *GisPlus* can also perform queries using a subset of the SQL language when you shell out to a special SQL editor or click on elements displayed on the map. You can perform spatial queries by pointing to an element, by defining a circle or radius, by defining a freehand shape, or by



FACT FILE

**GisPlus,
Version 2.0**
Caliper Corp.,
1172 Beacon St.,
Newton, MA
02161; 617-527-
4700.

List Price:
\$2,995.

Requires: 286-based PC or better, 640K RAM, hard disk, graphics adapter, math coprocessor, DOS 2.0 or later. Mouse recommended.

In Short: Routing and other special capabilities may make *GisPlus* seem attractive, but its poorly designed interface, difficult data handling, and lack of support for high-quality output make it a poor candidate for general-purpose mapping. Copy protected.



CONTINUES

CIRCLE 632 ON READER SERVICE CARD

GRAPHICS

MAPPING SOFTWARE

Suitability to Task

GisPlus

Thematic and pin mapping	☒	☒	☒	☒
Spatial analysis	☒	☒	☒	☒
Data and layer management	☒	☒	☒	☒
Presentation output	☒	☒	☒	☒

setting up a buffer zone around a point, line, or region.

Alone among the products in this review, *GisPlus* supports routing, which lets you calculate the shortest path between two points using existing routes and partition networks of routes into service areas. Several routing procedures, written in a proprietary command language with a supplied procedure toolkit, come with the program. In addition, you can purchase additional procedures from Caliper to perform advanced routing tasks, such as printing written directions based on the shortest path routine, or developing the most efficient route for traveling salespeople. You can also read distances simply by clicking on any two points on the map.

GisPlus's other advanced features may make it attractive to those with special needs. For databases containing an address field, you can perform Soundex phonetic searches as well as standard text searches. The program generates not only summary univariate statistics but also estimates of least-squares regression models, cross-tabulations, and correlation matrixes for numeric data fields. *GisPlus*'s topological data structure is particularly well adapted for combining area databases, letting you link the area boundaries so that any change made to the boundary of one area automatically changes the boundary and area of an adjacent parcel—a welcome feature.

INTERFERING INTERFACE

Although thematic mapping is not its main focus, *GisPlus* does offer a reasonable range of thematic mapping options, as well as pie or horizontal bar charts. It does not support bivariate thematic maps, however, so your ranges are confined to the active database layer. For pin mapping, you can store up to 36 conditions for each database and combine and intersect these conditions. The program displays points with user-defined icons and lines

MAPPING SOFTWARE: SUMMARY OF FEATURES

Products listed in ascending price order

	MapInfo for Windows	Atlas*GIS	GisPlus
DATA FILE HANDLING			
Database interface	☒	☒	☒
Spreadsheet interface	☐	☒	☒
Native data file format	.DBF	.DBF	Proprietary
Data file import/export formats:			
ASCII (comma-delimited)	☒ / ☒	☒ / ☒	☒ / ☒
ASCII (fixed-field)	☐ / ☐	☒ / ☒	☒ / ☒
ASCII (tab-delimited)	☒ / ☒	☒ / ☒	☒ / ☒
.DBF	☒ / ☒	☒ / ☒	☐ / ☐
.DIF	☐ / ☐	☐ / ☐	☐ / ☐
.WK1	☒ / ☐	☐ / ☐	☒ / ☒
SQL interface	☒	☐	☒
Data files per map	Limited by RAM	2	40
Database operations:			
Query/sort	☒ / ☒	☒ / ☒	☒ / ☒
Browse/filter	☒ / ☒	☒ / ☒	☒ / ☒
Join/append	☒ / ☐	☒ / ☒	☒ / ☒
Union/intersection	☐ / ☐	☒ / ☐	☒ / ☒
Search within range/Boolean search	☒ / ☒	☒ / ☒	☒ / ☒
Save and recall search sets	☒	☒	☒
Create indexes	☒	☒	☒
Calculate fields	☒	☒	☒
Summary/advanced statistics	☒ / ☐	☒ / ☐	☒ / ☒
PRESENTATION FEATURES			
Point symbols	30	93	255
Point colors	16.7 million	60	16
Line styles	2	10	1
Line weights	8	Unlimited	5
Line colors	16.7 million	60	16
Fill patterns	8	250	250
Colors	16.7 million	560	16
Transparent background	☒	☒	☒
Page layout elements:			
Legend/map scale	☒ / ☐	☒ / ☒	☒ / ☒
Number of insets	Unlimited	2	1
Move/size/rotate elements	☒ / ☒ / ☐	☒ / ☒ / ☐	☒ / ☒ / ☐
Freehand annotations	☒	☒	☐
Users can add symbols/lines	☒ / ☒	☒ / ☒	N/A
Drawing tools	☒	☒	N/A
Imports clip art	☐	☐	N/A
Groups and ungroups	☐	☒	N/A
Text annotations	☒	☒	☐
Justifies text	☐	☒	N/A
Rotates text	☐	☒	N/A
Number of fonts	Uses Windows fonts	7	None
Scales fonts to map size/to page size	☒ / ☐	☐ / ☒	N/A
Map file export formats:			
CGM	☐	☒	☐
.DXF	☐	☐	☐
HPGL	☒	☒	☒
.PCX	☐	☐	☒

☒—Yes ☐—No

N/A—Not applicable: The product does not have this feature.

CONTINUES



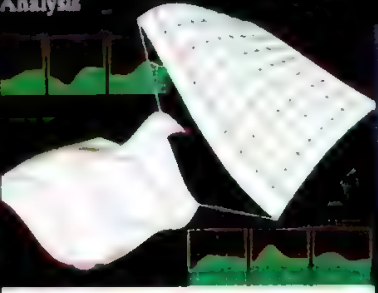
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Graftool, Version 3.3

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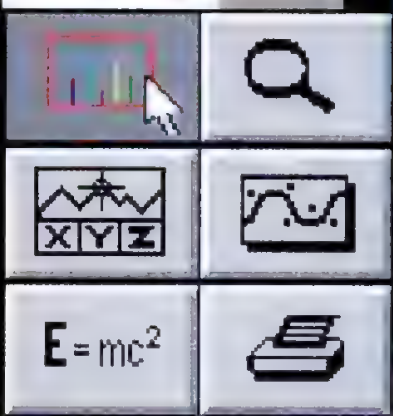
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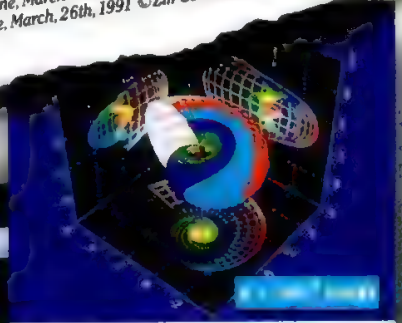
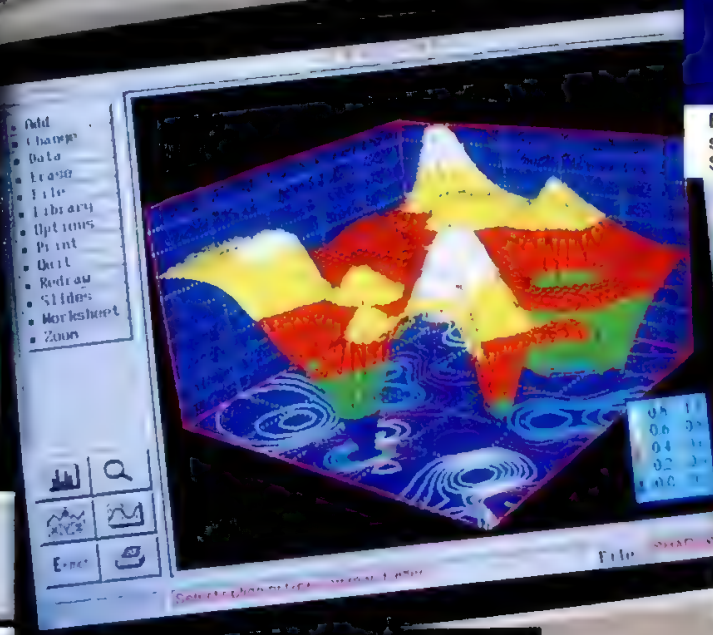
Surface Cross-Section Analysis



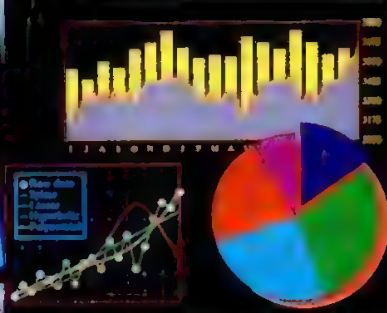
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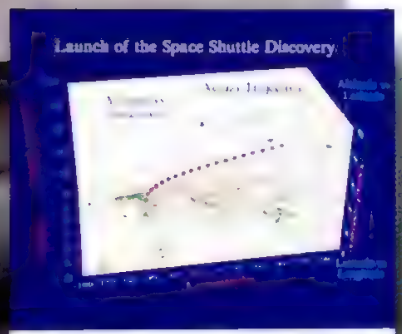
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CIRCLE 377 ON READER SERVICE CARD

SONY.

MAPPING SOFTWARE: SUMMARY OF FEATURES

Products listed in ascending price order

	MapInfo for Windows	Atlas*GIS	GisPlus
MAP CREATION AND EDITING			
Map file import/export formats:			
ASCII (with coordinates)	■/■	■/■	■/■
DLG	□/□	■/■	■/□
.DXF	■/■	■/□	□/□
Etak	□/□	■/■	□/□
TIGER	□/□	■/■	■/□
Map digitizing	□	■	■
Map file editing:			
Adds/edits map elements	■/■	■/■	■/■
Copies map elements	■	■	■
Boundary editing:			
Adds/deletes boundaries	■/■	■/■	■/■
Joins/breaks boundaries	■/■	■/■	■/■
Traces boundaries	■	■	□
Checks boundaries for closure	■	■	■
Geocoding:			
By pointing/by feature	■/■	■/■	■/□
By address matching	■	■	■
Batch mode	■	■	■
SCALING AND PROJECTION SYSTEMS			
Scales in miles/kilometers	■/■	■/■	■/□
Scales latitude-longitude	■	■	■
Projections and coordinate systems:			
Standard Mercator	■	■	■
Conic equal-area	■	■	■
State plane coordinates	□	■	■
User-defined coordinates	■	■	□
DEVICE SUPPORT			
Printers and plotters supported:			
Epson printers (dot matrix)	■	■	□
Hewlett-Packard LaserJet	■	■	■
Hewlett-Packard PaintJet	■	■	□
Hewlett-Packard plotters	■	■	■
PostScript/color PostScript	■/■	■/■	□/□
Film recorders	■	□	□
Graphics adapters supported:			
EGA/VGA	■	■	■
Super VGA	■	■	■
TIGA	■	□	□
8514/A	■	□	□
MEMORY SUPPORT			
Expanded memory	■	■	■
Extended (protected-mode) memory	■	□	■
Virtual memory	■	■	■
DOCUMENTATION			
Help	Context-sensitive	Context-sensitive	Indexed
Tutorial	■	■	■

■—Yes □—No

ENDS

and defines areas with variable widths and colors. You can also add labels that contain data from any record field, although you can't select fonts or control the placement of such labels. A good selection of fill patterns and symbols are available, but these must be selected in sets. You cannot assign individual attributes to specific data.

GisPlus suffers severely from the awkwardness of its interface. Most commands can be selected via keyboard or mouse (except in *GisBuild*), but using the mouse is confusing. You must activate items with the right button and select them with the left, and only through experience can you learn which menu items must be activated and which ones must be selected. In the data editor, you can select individual cells with the mouse, but you must scroll and select individual records with the keyboard. There are no scroll bars on the map display, so scrolling and panning must be executed by selecting menu commands. There is an indexed help system, but it is not context-sensitive, and there is no help available for the *GisBuild* module.

FASCINATING, BUT...

GisPlus is even more deficient in its presentation options. Although you can move map elements around, it has no text or freehand annotation capabilities at all. *GisPlus* unfortunately is also lacking in its printer options. Although it supports a small number of pen plotters and the Hewlett-Packard LaserJet Series II printer, it does not support PostScript devices or the HP PaintJet for color output. Colors on your thematic map aren't converted to gray scales or patterns when printing to a LaserJet, so to get readable black-and-white output you must replace the filled color areas with patterns manually. Finally, *GisPlus* cannot export maps in CGM format; though you can create color .PCX files through a built-in screen-capture facility, these files failed to display properly in some standard graphics programs in our testing.

GisPlus is a fascinating yet frustrating product. Its advanced features, particularly its network and routing functions, and its use of raster images for tracing make it uniquely capable for some tasks. But its poor implementation of features, its lack of adequate output choices, and its awkward interface are crippling. Unless you need its special talents, you will do best to steer clear of it.

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WYSIWYG graphic interface	No	YES
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Graphic support (logos, clip art)	No	YES
Bitstream fonts included	No	YES
Designer AND Filler included	No	YES
Windows upgrade available	No	YES
Suggested retail price*	\$99.95	\$149

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CIRCLE 250 ON READER SERVICE CARD

PerFORM 2.1



PERFORMANCE TESTS: MAPPING SOFTWARE

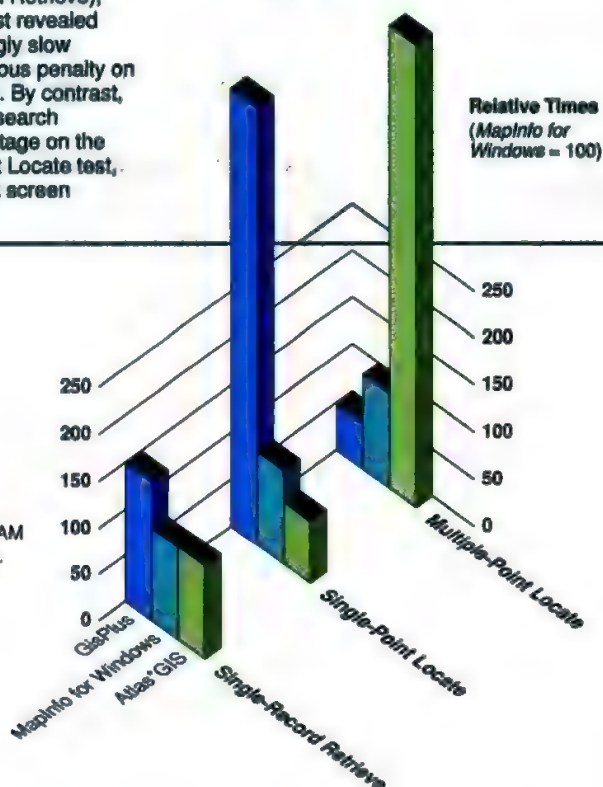
A combination of fast database query responses and speedy screen updates gives *MapInfo for Windows* the best overall performance of the three packages tested.

TESTING ANALYSIS

These performance tests are task-oriented, designed to demonstrate the wait you would have to endure while performing three simple interactive operations.

While *Atlas*GIS* and *MapInfo for Windows* showed decent database query performance (Single-Record Retrieve), the Multiple-Point Locate test revealed that *Atlas*GIS*'s excruciatingly slow screen updates exact a serious penalty on display-intensive operations. By contrast, *GisPlus*'s slower database search capacity put it at a disadvantage on the query-intensive Single-Point Locate test, in spite of its relatively quick screen updates.

The reported scores are taken from tests we performed without a math coprocessor (except in the case of *GisPlus*, which requires one); a coprocessor improved *Atlas*GIS*'s screen redraw times by about 2 percent. *MapInfo* does not support a math coprocessor.



HOW WE TESTED

We ran these tests using indexed files on a Compaq Deskpro 386/25 with 4MB RAM and a Compaq VGA adapter.

	Single-Record Retrieve	Single-Point Locate	Multiple-Point Locate
	Elapsed Time (seconds)	Elapsed Time (seconds)	Elapsed Time (seconds)

GisPlus	3	14	57
MapInfo for Windows	2	3	119
Atlas*GIS	2	2	586

■ The **Single-Record Retrieve** test measures how long the program takes to pull up the record underlying a given data point on a pin map created from a 7,500-record database.

■ The **Single-Point Locate** test measures how long the program takes to locate and highlight a point on the map based on a database query.

The **Multiple-Point Locate** test measures how long the program takes to display the locations of over 1,330 points on the map. This is akin to creating a large multiple-point pin map, and includes the time required to draw the map.

MapInfo for Windows

by Mitt Jones

MapInfo Corp. has done what few companies have had the guts to do: Take everything it has learned in the past five years about how its customers use its best-selling *MapInfo for DOS* and start over. The resulting package, *MapInfo for Windows*, lacks some important features and suffers from a tendency to crash, but its basic design is virtually ideal for helping business users tackle the complex chores of mapping. At \$995, it also ranks as the least expensive package reviewed here.

The problems with this initial version seem to be caused by haste. MapInfo Corp.'s strategic planning has certainly been anything but hasty. The company

Suitability to Task

MapInfo for Windows

Thematic and pin mapping	■	■	■	■
Spatial analysis	■	■	■	■
Data and layer management	■	■	■	■
Presentation output	■	■	■	■

offers the same package, based on the same C code, for the PC, Macintosh, and Sun platforms, and its design is chock-full of state-of-the-art features. The program's elegant file system, for instance, will read and maintain .DBF files directly, adding its own data definition table to help in future accesses. It also reads *Lotus 1-2-3* (.WK1), *Excel* (.XLS), and delimited ASCII files directly through the File Open menu.

MapInfo for Windows can perform SQL queries or ordinary form-based queries and allows you to select and join data much as you would with a powerful relational database package. Every query produces a separate selection table linked to the source tables, which can then be used for further operations, including additional queries or edits to the original table. This standard mode of relational operation makes *MapInfo for Windows* hard to beat for flexibility in ad hoc searches, although it does lack three relational operators (append, combine, and intersect) that sophisticated users will undoubtedly miss.

MapInfo for Windows makes good use

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GRAPHICS MAPPING SOFTWARE

of its graphical environment: You can display related maps, tables, and graphs simultaneously, and any changes and selections you make in one window will be reflected immediately in every other window. Like its competitors, it requires several files for any given map, but it uses a single data definition file to tie together and maintain the files so that you can open the entire map in a single operation. You can choose to see any combination of map, browse, or graph views of the data using check boxes, and once you've set up your windows, you can save the entire setup, including multiple maps, as a workspace for recall at a later time.

The program comes with a complete set of U.S. state maps, which you can match with its five-digit ZIP code centroids file for geocoding addresses, as well as maps of Canada (with provinces) and world countries. MapInfo Corp. sells an exhaustive selection of converted TIGER files, including state counties, ZIP code boundaries, street maps, highway maps, and railway maps. A street and ZIP code map of San Francisco and several samplings of state demographic, geographical, and economic data are included for tutorial and sample use.

NOTED WITH REGRET

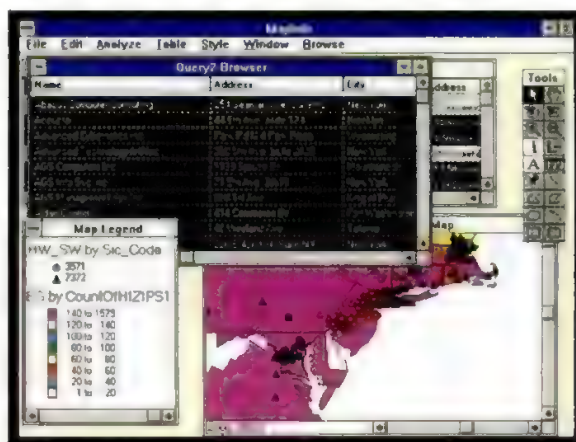
MapInfo for Windows shows a few weaknesses of range when you look at specific mapping features. You can easily shade regions by quantiles, equal proportions, or user-specified ranges, but you cannot shade by standard deviations, create bivariate thematic maps, or create pin maps with proportionally scaled symbols. Though it has a radius-search tool to select points within a given distance of another point, it does not let you create a buffer zone about a boundary or line, so you're out of luck if you need to select all objects within 35 miles of any stretch of Interstate Highway 81, for example. The program also lacks the ability to generate summary statistics automatically; to get these, you must calculate them in the data sheet by inserting your own mathematical formulas.

Though *MapInfo for Windows*' lack of

digitizer support will be a liability to those who need to add subdivisions to a map, its impressive collection of freehand drawing tools are fully adequate for less-demanding additions. The ability to snap to nodes on the map makes it easy to align objects with map features on the same layer or on a different layer, but there's no snap-to-grid feature, so it's difficult to align objects on the page.

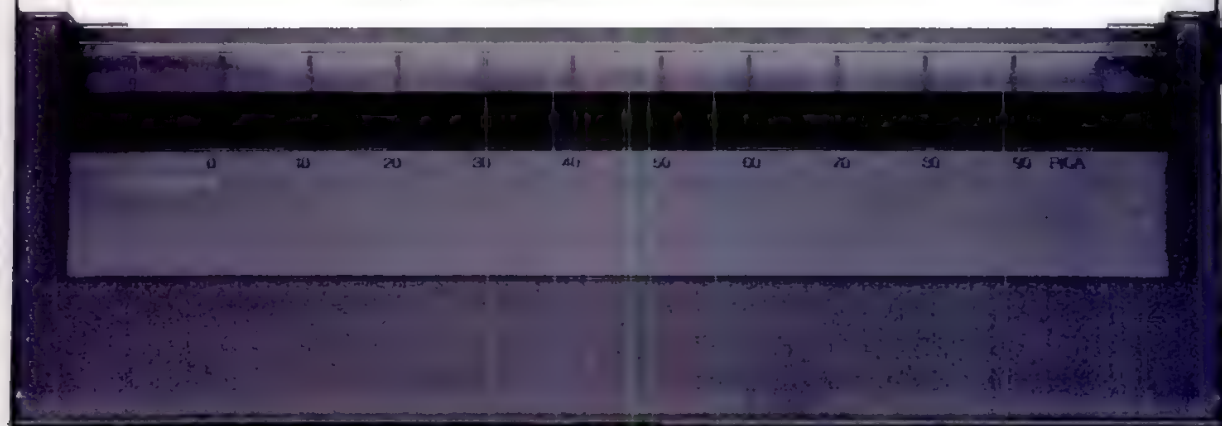
In fact, if you need presentation-quality output, count on arming yourself with other tools. *MapInfo for Windows* can export maps in EPS format as well as *Windows*' .BMP and HPGL formats. As a *Windows* program it supports a substantial list of printers and high-quality devices such as film recorders, and it relies on *Windows*' ample facilities for font and color options. But it provides no means for editing legend titles or labels, and positioning the legend is a trial-and-error proposition.

MapInfo for Windows' final failing can best be described as a lack of robustness. The program crashed many times during its two weeks of testing, usually as a result of the program's being asked to do something it wasn't designed to do, such as plotting points using coordinates it could not properly interpret or reading a *Lotus 1-2-3* file with a layout it couldn't understand. The manual's failure to address such issues adequately, if at all, adds an extra element of frustration. Also, although *MapInfo* turned in some impressive times on our performance tests, more complex queries can bog it down (for



In *MapInfo for Windows*, you need to open only one table to display a map layer, browse its data file, or graph it. You can decide which combination of the three views to display by clicking on a dialog box.

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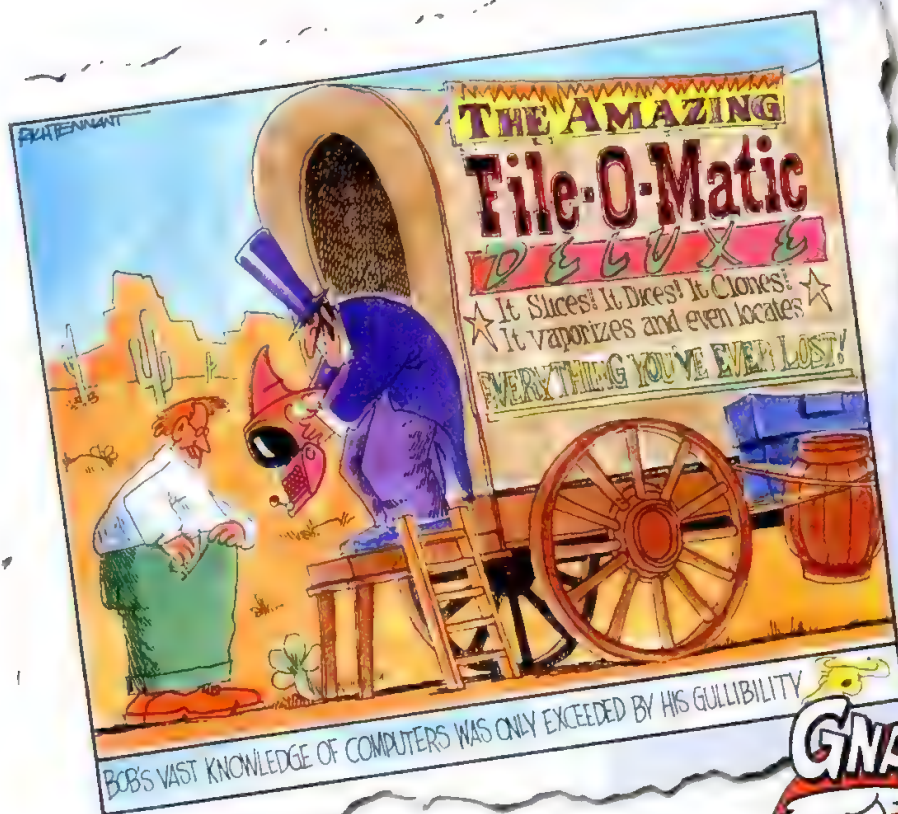
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* Based on US dollar market share of competitive models for the 12 months ending December, 1990, as reported by InfoCorp (1/91)

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FACT FILE

MapInfo for Windows, Version 1.0

MapInfo Corp., 200 Broadway, Troy, NY 12180; 800-327-8627, 518-274-8673.

List Price: \$995; U.S. county maps, \$95 per state or \$495 for complete set; U.S. ZIP code boundaries, \$395 per state or \$3,995 for complete set; U.S. street maps, \$225 per county or \$60,000 for complete set; U.S. highway and railway maps, \$95 per state or \$1,995 for complete set.

Requires: 286-based PC or better, 2MB RAM, hard disk, EGA or VGA graphics adapter or better, mouse, DOS 3.1 or later, Microsoft Windows 3.0.

In Short: This Microsoft Windows-based product falls a bit short of the competition in features, but *MapInfo for Windows* more than compensates with its excellent data handling and clarity of design. Although the version we tested is marred by a few bugs, it remains a good choice overall.

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example, a SQL query that combined selected fields of two files by matching on ZIP codes took 40 minutes).

As this issue went to press, MapInfo Corp. was preparing Version 1.1 of *MapInfo for Windows*, in which bugs will be fixed, performance boosted, window handling improved, and several needed features added, including digitizer support, summary statistics, and 20 new SQL functions (but still no append, combine, or intersect functions). Another future release will add a powerful programming language similar to that now supported in the DOS version of *MapInfo*.

MapInfo for Windows' thoughtful design and powerful windowing environment do a superb job of making geographical analysis accessible to ordinary users. Those who need capabilities such as bivariate thematic shadings, proportional symbols, buffered searches, and in-depth statistical functions will have to look elsewhere. But provided that MapInfo Corp. eliminates the rough edges we experienced in Version 1.0, those who can get by without such features will find this package to be the best buy. ■

Mitt Jones is a contributing editor of PC Magazine. Robert Kendall and Paul Murphy are frequent contributors. Rock Miller is an associate editor of PC Magazine.

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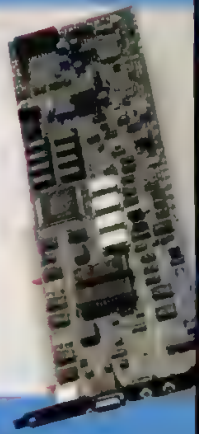
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Reaching Out With LAN Remote-Control Software

For training, supporting, or supervising your staff, LAN remote-control software provides the next best thing to being there. These 12 packages allow you to view and control the activity on remote users' screens without ever leaving your desk.

by Carol Ellison

A little popularity goes a long way in the lives of network managers and technical-support staff. The help-desk phone rings, proclaiming another day of wear and tear on the shoe leather. The marketing director on the fifth floor reports an error message that declares the networked CD-ROM database corrupted. Over in the legal department, an office temp who's typing a \$500,000 contract confesses ignorance of *Microsoft Word* 5.5's formatting commands. And a sales assistant down the hall is printing letters that appear to be written in Sanskrit. With people to train, peripherals to reboot, and proper printer drivers to load, a body should be able to be in two places at once.



LAN REMOTE-CONTROL SOFTWARE: THE MAIN CONNECTIONS

Most LAN-based remote-control programs use a guest/host model, where application programs run on the designated host but can be seen at both the host and guest. This model allows four basic kinds of connections: one guest to one host, one guest to many hosts, many guests to one host, and daisy-chaining, where one or more systems act as guest to one system and host to another.

One-to-one connections are the simplest possibility, and the only ones guaranteed to be available in all remote

programs. With this type of connection, you can provide support or instruction for one person at a time, or allow one station at a time to control a shared resource such as a fax server. A one-to-one connection is also effective for co-computing, where two individuals work together on a given document. Co-computing works best when host and guest function on a nearly equal footing, using chat windows and calling each other.

A one-to-many connection lets a single guest move from host to host with minimal

effort. Ideally, a one-to-many connection will show multiple hosts on-screen, each in its own window. More often, the guest sees hosts one at a time, each displayed in a full screen. The guest can typically hotkey from one host to the next, or call up a menu of active hosts, highlight a host name, and hit Enter, all without breaking the connection to the first host. Some programs closely simulate one-to-many connections by letting you choose another host from a menu, but require that you disconnect from the first host.

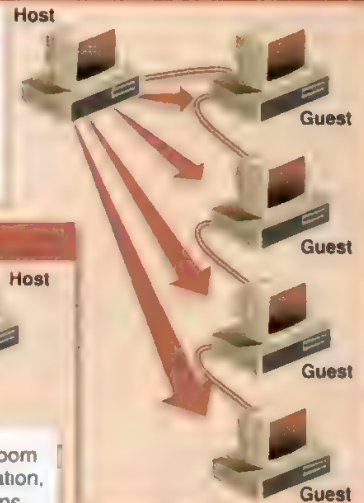
One Guest to One Host



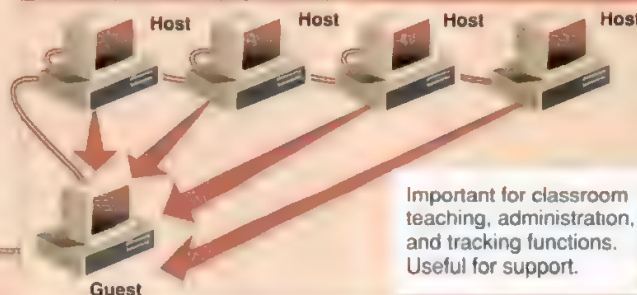
Appropriate for support, instruction, and control of shared resources. Guest and host must be on a nearly equal footing for effective co-computing.

Many Guests to One Host

Essential for classroom demonstration and workgroup co-computing. Useful for support, allowing multiple support stations to view one host.



One Guest to Many Hosts



Important for classroom teaching, administration, and tracking functions. Useful for support.

LAN remote-control software, the next best thing to being there, almost makes that possible. These programs grew out of the notion that support never need be more than a keystroke away—they can bring the expertise of a trainer, technical analyst, network manager, or other experienced user at one workstation to the keyboard of another via the network cable. The expert connects as a guest to the other user's host workstation; with this one-to-one connection, the guest can view the screen of the host PC and even take control of the host's keyboard. The terminology can be confusing: While we use the term host to refer to the workstation that's being taken over and guest to refer to the one that's doing the taking, the 12 programs we reviewed employ many terms to describe these functions, among them

host and viewer, host and caller, listener and caller, and master and slave.

These node-to-node products should not be confused with modem-based remote products. Years ago, modem-based remote-control software implemented the concept of hosts and guests, letting consultants, resellers, and user-support organizations troubleshoot clients' PC problems from distant locations. LAN-based products like Dynamic Microprocessor Associates' *pcAnywhere IV/LAN* and Norton-Lambert's *Close-Up/LAN* stem from successful serial-connection programs also sold by those companies. (See the sidebar "Modem-Based Remote Control: The Serial Alternative.")

In this review, PC Magazine LAN Labs evaluates 12 LAN remote-control packages: *Argus/n InterNetwork*, *Close-*

Up/LAN, *EXAC*, *Invisible Control*, *LAN Assist Plus*, *LANshare*, *LANsight*, *NetOp*, *NETremote Plus*, *The Network Eye*, *pcAnywhere IV/LAN*, and *Remotely Possible*.

MANY WAYS TO CONNECT

Adapted to LANs, these products simplify the lives of network managers by letting them communicate with a user across the cabling as if they were sitting down at the user's workstation. This helps to eliminate the time-consuming support system which keeps managers moving back and forth among workstations, solving users' problems. Managers can also use these packages for training, distributing the network's hardware wealth, or facilitating workgroup activities. Some products allow an individual to access

This sort of connection is particularly useful for classrooms, where a single teacher needs to observe many students. It also lends itself to administrative functions where a supervisor needs to observe workers' systems. The ability to move easily from one host to another can also help support staff.

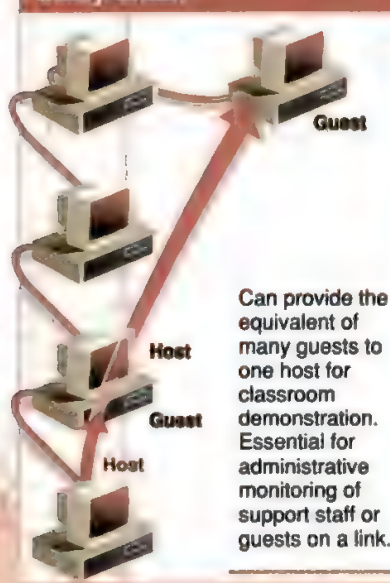
A many-to-one connection is ideal for classroom demonstrations, where a teacher can be host to multiple students. In support applications, this sort of connection lets more-experienced members of the

support staff join a conversation when a problem stumps a less experienced individual. Multiple guests also facilitate workgroup co-computing.

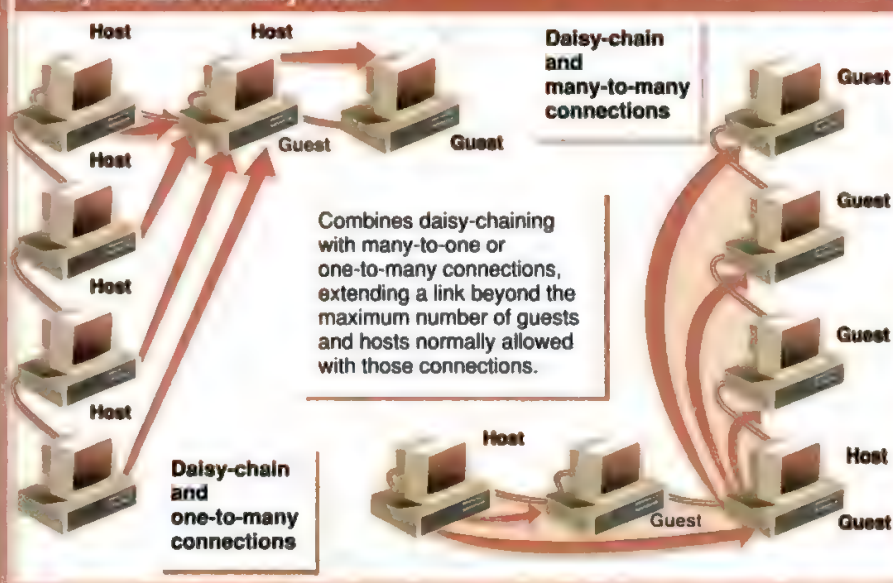
With daisy-chaining, less common but still of interest, one or more systems act as both guest and host, letting a guest view a system that is in turn viewing another host. Daisy-chaining can serve the same function as a many-to-one connection, since each system in the chain can view the host lying at one end of the chain. But the real value of daisy-chaining comes

when it is combined with many-to-one or one-to-many connections to build many-to-many connections. With a daisy-chain connection, the supervisor of a support staff can watch a support station as it views a host system on a one-to-many connection. Similarly, with programs that allow only a limited number of guests on a single host, you can combine daisy-chaining with many-to-one connections so that more guests can view the one host.

Daisy-chain



Many Guests to Many Hosts



high-powered resources (for example, sending a massive spreadsheet to a dedicated 486 host to be recalculated at high speed), or to share modems, printers, and fax boards through built-in options.

If the remote-control software supports multiple connections, one user on the network can work interactively—or co-compute—with others to make changes to a single file, employing a many-to-one (many guests to one host) connection. A chat feature also can help make co-computing easier.

Many-to-one links are perhaps more common in classrooms and training situations; a one-to-many (one guest to many hosts) link also suits these environments well. With a one-to-many connection, an instructor can connect to students' machines to demonstrate, for example, how

to use a new software product. With the former option, many students can connect to the instructor and view the steps he or she takes; guests can even participate in the lesson by manipulating the host machine.

All this group participation can present problems. The software itself rarely has a mechanism to referee keyboard wars. Most programs address the problem by providing the option of disabling the keyboards of guests in the connection. *Invisible Control* goes a step further by allowing multiple guests to monitor a host, but never to manipulate it.

In a true one-to-many connection, a guest can hotkey from one host to another, or call up a menu of active hosts, highlight one, and access it without breaking the connection to the first host. Many remote-

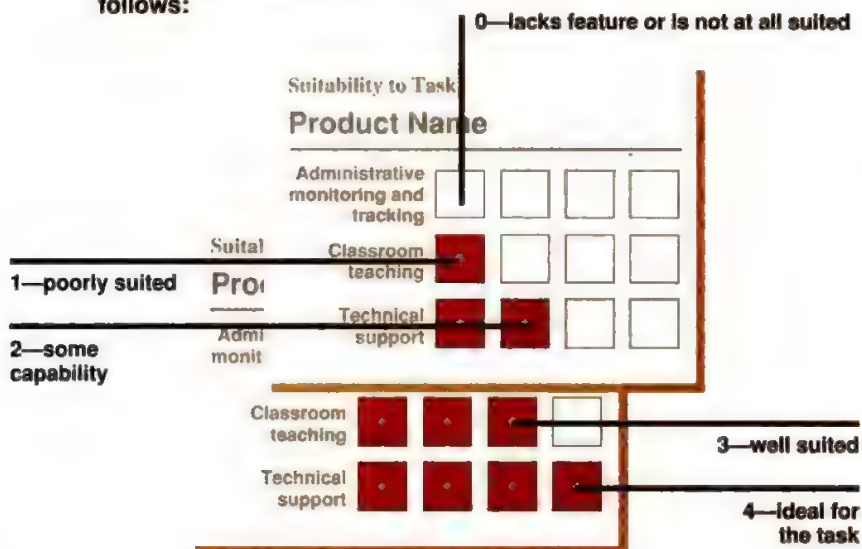
control products allow this, but only *Net-Op*, distributed by International Inter-group, and Artisoft's *The Network Eye* allow a guest to view multiple host screens simultaneously.

Other products do not support multiple host connections directly. With *LANsight*, for instance, you must disconnect from one host and go through a few menus in order to select a new host; Dynamic Microprocessor Associates claims a one-to-many capability for *pcAnywhere IV/LAN*, but changing hosts requires a minimum of five keystrokes. Other packages that do not supply true one-to-many connections simulate them more elegantly. *Invisible Control*, *LAN Assist Plus*, and *NETremote Plus* all offer a reasonable semblance of one-to-many operation by requiring a minimal number of keystrokes to discon-



LAN REMOTE-CONTROL SOFTWARE: SUITABILITY TO TASK

PC Magazine assesses each LAN remote-control software package's suitability in three areas—administrative monitoring and tracking, classroom teaching, and technical support—and assigns a point value for each one. These subjective ratings, on a scale of 0 to 4, are presented along with each review and translate as follows:



Administrative monitoring and tracking rates the product's ability to monitor and track network users and resources. It can accomplish this in various ways, such as maintaining error logs, or providing information on topics such as server and network configurations, node addresses, open files on a host, print jobs currently in process, or IPX/SPX/NetBIOS packet statistics.

Classroom teaching rates the product's ability to perform in teaching or training situations. The important features for this application include support for true many-to-one and one-to-many

connections, broadcasting, and the ability of the guest to log on to a host without being rejected, or to sign on as an observer without the host's knowledge.

Technical support rates the product's ability to allow guests to assist hosts with technical questions, such as problems with applications or drivers. The program can help by providing information on a host's configuration (the processor, operating system version, and memory) and the programs it has loaded in memory, or by letting the host initiate a call.

nect from one host and access another.

Some products offer daisy-chaining capabilities in place of, or in addition to, many-to-one connections. This arrangement allows one workstation to act as both host and guest; the machine viewing the screen of a host station is itself viewed by another guest. Other products offer a broadcast mode, where a user can designate any station to broadcast its screen to other stations on the link. (See the sidebar "LAN Remote-Control Software: The Main Connections" for a further discussion of the various links available with these products.)

Some programs are more suited to diagnostics and administrative monitor-

ing of users and the network than teaching or support functions. A typical feature of these packages is the ability for a guest to view the hardware configuration of any workstation with the software installed. *LANsight* lets you monitor traffic on the network and *Triticom's Argus/n InterNetwork* features databases that automatically log information about network nodes and segments.

HOW THEY RUN

In a typically configured remote-control program, the software's host mode loads automatically when a user logs on, then waits in the background until a guest calls. Some programs, like *Close-Up/LAN*, also

allow the host to call on the guest. A fair portion of the products we reviewed can load the guest module as a TSR, but often the module runs as an application that you can load using command line switches to control the number of available options, and thus the amount of memory consumed. *Remotely Possible* allows you to load host and guest shells in expanded memory; many others do not. Fortunately, most packages have shrunk their host shells to manageable size; *NetOp's* host can even be installed in 1K to 2K.

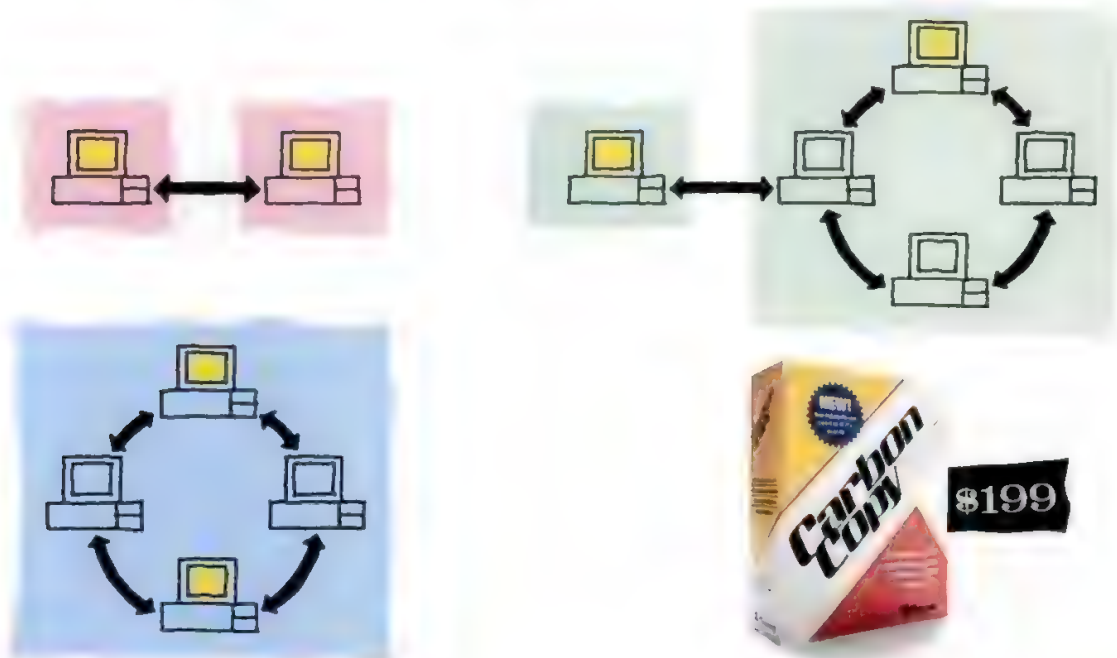
Useful as these programs are for training and troubleshooting, they present the potential of abuse. Forget the Big Brother specter of management spying on employees. The network manager has other risks to consider with remote-control software. You don't want guests calling up the screen of the company's chief financial officer when budgets are being decided, or viewing activity in the personnel department when raises or performance reviews are being processed. Luckily, most programs can control unwanted intrusions on the host by using a variety of configuration options, such as authorized-user lists and password protection. Typically, they will also flash screen messages or audible signals to alert hosts to the presence of guests. In fact, many countries require that the software inform the host when a guest is attached.

Some of these packages, such as *Argus/n InterNetwork*, do not notify host stations when they are being monitored, and most others allow notification to be deactivated. But while more unsophisticated users may never suspect they're being watched, anyone who does can usually detect the presence of a remote-control program by simply doing a DOS TYPE of their AUTOEXEC.BAT or batch files called from their log-on script or by using a utility like *PC Magazine's* MEM to check for unusual memory consumption on the workstation.

REVIEW CRITERIA

For this review, we required that the products run over *NetWare 386*, using either Novell's NetBIOS emulator or IPX transport protocols. (We did not look at products that provide remote facilities over asynchronous links only). *DCA's R2LAN* was not reviewed because, while it worked well under *NetWare 2.2* using a NetBIOS emulator when we last reviewed these products, it does not work across *NetWare 386*, Version 3.1.

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We did not include D-Link's *Screen Monitor* because the company had a new version in the works at the time of our review; a node-to-node version of Triton's *Co/Session LAN II* was also not available in time for our review. Central Point Software's *Commute*, due to ship in June, offers both serial and node-to-node connections. Compatible with *NetWare*, *Commute* will be available in *PC Tools* and sold separately. Ultinet's *Remote Access* features support for OS/2 via *LAN Manager* and was scheduled to ship in April.

And Ocean Isle's *ReachOut*, which was set for June release, will be the first Windows-based remote-control application.

TROUBLE WITH WINDOWS

In general, *Windows* presents problems for the products in this roundup. For most of these packages, support for hosts running *Windows* extends only to the ability to view. Many of them cannot pass the Alt keystrokes (needed to control Win-

dows) from the guest to the host machine. While *EXAC*, *LAN Assist Plus*, and *pcAnywhere IV/LAN* can use the keyboard to control a host running *Windows* in Real mode, only *NetOp* and *Remotely Possible* can achieve the same feat with hosts running the program in Enhanced mode, the *Windows* mode that lets you take advantage of the 386 processor's ability in its Virtual 86 mode to multitask DOS applications. And, of the 12 products we reviewed, only *Remotely Possible* includes mouse support.



EDITORS' CHOICE

■ Nice for a niche, but no winner

LAN remote-control software has made strides since we last reviewed this product category, nearly two years ago. For instance, some packages we looked at last time have raised their graphics support to VGA, and almost all the programs introduced since then can transfer a graphics image from a VGA-equipped host to a VGA-equipped guest. *Close-Up/LAN* earned our Editors' Choice recommendation last time for reasons that still apply today: It handles all types of multiple connections, is easy to use, and offers a range of features, including niceties such as a chat window. But *Close-Up/LAN* has not kept up with the competition; the program does not support graphics beyond CGA.

A problem for nearly half the programs we reviewed was their inability to transfer a graphics image from a host with a VGA display to a guest with an EGA display. Three products had problems delivering a graphics image from a host with an EGA display to a guest with a VGA display. It's difficult to recommend any product as Editors' Choice that does not support VGA graphics, or that cannot successfully translate a graphics image between machines equipped with unlike displays. Too many LANs still have a wide mix of display types, with some machines on the network employing high-end graphics.

Many products in this category need to mature in other ways. Only one of these packages could support a guest's mouse on the host machine. The majority could not use the keyboard to control a host running *Microsoft Windows 3.0*; of those programs that could, only two supported a host running *Windows* in Enhanced mode. Additionally, many organizations locate the support staff and network administrator on a different floor, or even a different building, from the users. This makes the ability to support a host connected over a bridge an important feature. While most packages could at least transmit a *WordPerfect* macro across our test bridge, four proved incapable of doing even that.

In general, none of these products provide the combination of a well-considered design and ease-of-use for a wide variety of applications that would make one clearly stand out as Editors' Choice. For example, a majority of the packages reviewed here do not offer true one-to-many connections (although some compensate by simulating them well), a useful feature whether you're interested in using the package primarily for teaching, technical support, or administrative functions.

That doesn't mean you won't find a program here that meets your needs. Though lacking features that would elevate them to Editors' Choice standing, some of these products ably fill a niche. *EXAC*

implements a master/slave model with a broadcasting capability that makes it particularly well-suited for a classroom environment, and it handles graphics quite nicely. *LANsight*, like *EXAC*, passed all our graphics tests. It features extensive monitoring and diagnostic capabilities that will make it useful to LAN administrators. *pcAnywhere IV/LAN* provides a standard communications program, built-in modem-based remote operations, and LAN remote-control capabilities. One of only two packages to successfully complete all our pass/fail tests, it makes a fine choice if you need all these capabilities, but its very diversity also makes it one of the most difficult programs to learn. *NetOp* gets points for being well-rounded, if somewhat slower than expected for a program that defaults to nonsynchronous mode. It has the advantage of operating with only the tiniest of RAM overhead (1K to 2K), and offers the ability to view multiple hosts on-screen simultaneously (the only other package with this feature is *The Network Eye*, which lacks support for any graphics). *NetOp* was the only product except *Remotely Possible* that was able to use the keyboard to control a host running *Windows* in Enhanced mode. The main drawback of the current version is that it has a compatibility problem using IPX with *NetWare 386*, Version 3.1 and later.



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PC MAGAZINE

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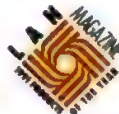
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GRAPHICS HANDLING

When we last reviewed these packages, we discovered that the programs then available often had problems handling programs operating in the graphics mode. *The Network Eye*, which has not been updated since that review, still doesn't attempt to transfer graphics screens, although Artisoft expects to release a version with graphics support later this year.

You'll have to decide what performance factor—speed, the ability to view more intermediate screens, or a minimum of network traffic—is most crucial to you.

Close-Up/LAN has been updated since our last review, but it does not yet handle graphics screens beyond CGA. Other products have matured in this area: *LAN Assist Plus*, which previously offered no graphics support, was able to successfully transmit a graphics image between two VGA displays, and to transfer graphics screens between an EGA host and a VGA guest, although not vice versa. *Argus/n InterNetwork*, *EXAC*, *Invisible Control*, *LANshare*, *LANsight*, *NetOp*, and *pcAnywhere IV/LAN* all successfully transmitted a graphics image in all modes on our pass/fail tests. (Even so, don't expect that the graphics image will always transmit with complete accuracy; although all the products that passed our tests maintained the integrity of visual details, the palette colors did not always exactly match those produced on the host display.)

Many of the products we reviewed claim wide-area support across a Novell bridge, and the majority transferred both a test graphics image and a *WordPerfect* macro across the Eicon X.25 bridge we used in our tests. Although we did not time these tests, the products unsurprisingly tended to operate more slowly across the WAN than the LAN. A few products

CONNECTIVITY LAN REMOTE CONTROL

were unable to pass one or both of these tests, which could impact your purchasing decision if you need to support users on different floors, or even different locations. This is the typical use for bridges and routers, but separate floors can be on the same network segment at some sites; conversely, other sites use bridges in a single office.

PRICING AND PERFORMANCE

This batch of products offers a wide variety of pricing schemes, running the gamut from per user to per server to per network. The best bargain depends in large part on how many users and servers you have attached to your network.

Performance is always a consideration, but you should keep in mind that LAN remote-control software usually has a split between a product's speed and its ability to view a greater number of intermediate screens. Products generally operate in either synchronous or nonsynchronous mode as a default (although the companies may use other terms for these connections). Nonsynchronous products, which send timed screen updates, usually provided faster scores on our benchmark tests. Synchronous products, which send screen changes (and generally force an update once per second even when there are no changes), by and large provided slower scores—though not remarkably slower—on the benchmark tests. Products operating in synchronous mode also transmit a greater number of intermediate screens to the guest, so the guest always receives a truer picture of host activity. The increased overhead created on the host explains the slower benchmark test scores. Most synchronous products let you select a nonsynchronous mode for faster performance.

Products that compress data or send only screen changes typically generate less network traffic. Products that follow other methods may perform faster, but also generally increase the load on the network, which can affect throughput for other network operations.

You'll have to decide what performance factor is most crucial to your organization: speed, the ability to view a greater number of intermediate screens, or a minimum of network traffic. You'll also want to consider whether you want a program primarily for its diagnostic powers, its ability to erase the last vestiges

of Sneakernet from your network, or even for its surveillance abilities. Once you determine your needs, you should find that one of the products we review here will meet them.

Argus/n InterNetwork

by Wendy Dugas Pérez

Like its 100-eyed namesake Argus, commanded by the Greek god Zeus to keep a vigilant watch over Io, Triticom's *Argus/n InterNetwork* ceaselessly monitors your LAN activity and configuration. Triticom markets two versions of the package. The one we reviewed, *Argus/n InterNetwork*, Version 1.30, costs \$645 for up to five segments, each segment with 250 users. Each additional set of five segments costs \$495, up to a total of 100 network segments. The other version, *Argus/n*, costs \$245 for a single LAN segment.

Despite its close watchfulness, there's room for improvement. *Argus/n InterNetwork* runs over IPX on Novell *NetWare*, Version 2.1 or later. The guest program does not run as a TSR but requires a healthy 400K of RAM. Depending on the command line option you specify, the host TSR takes up 6K if you want remote-control capabilities, or 4.5K if you only want to monitor and diagnose the workstation. Neither program makes use of expanded or extended memory. If you decide to remove the host TSR, you'll need to reboot.

DIAGNOSTIC DATABASES

Argus/n InterNetwork's main advantage is easy access to diagnostic information. *Argus/n InterNetwork* automatically builds and maintains two databases. One keeps track of workstations on particular segments; the other monitors the segments themselves, providing information about

Suitability to Task

Argus/n InterNetwork

Administrative monitoring and tracking				
Classroom teaching				
Technical support				

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5. Monitor (circle one):

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VGA Other _____

6. Do you use a mouse? (circle one)

Yes No

7. Modem Type:

☐ Internal ☐ External

☐ 300 ☐ 1200 ☐ 2400 ☐ 9600

8. National online services you have used:

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☐ PC-Link ☐ Other (please specify)

☐ GENie _____

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PC/XT AT/286 386/486

Other _____

2. Memory (circle one): 512K 640K 1MB or more

3. Do you have a hard drive? (circle one)

Yes No

Minimum memory requirement 512K; hard drive recommended.

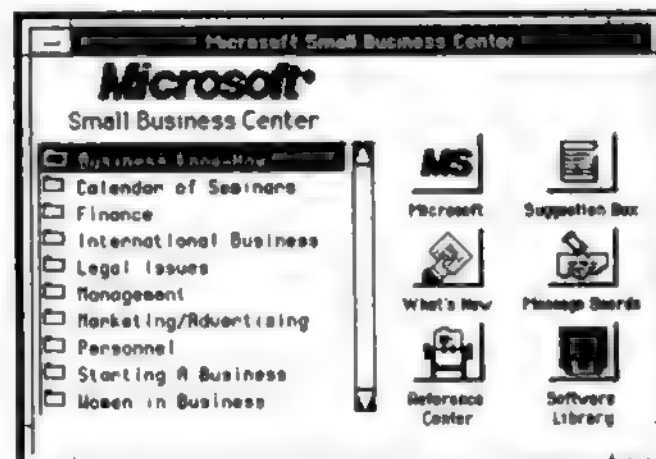
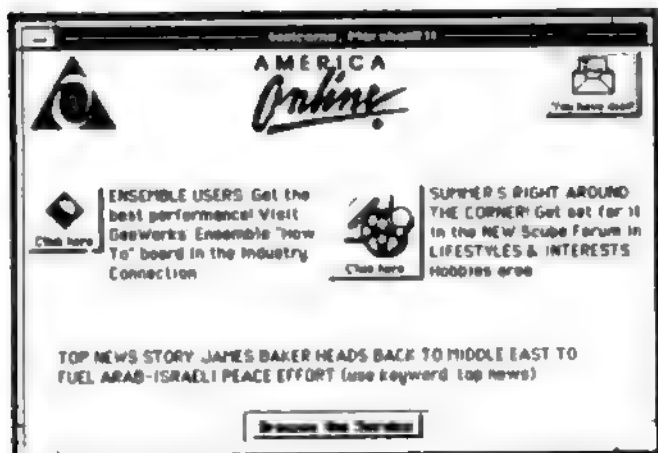
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CONNECTIVITY

LAN REMOTE CONTROL



**Argus/n
InterNetwork,
Version 1.30**
Triticom,
P.O. Box 11536,
St. Paul, MN 55111;
612-937-0772,
612-937-1998.

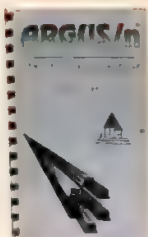
List Price: Up to five
network segments
(each segment

capable of handling up to 250 users), \$645;
every five additional network segments, up to
a maximum of 100 segments, \$495. Each
Argus/n network segment, \$245.

Requires: For host TSR: 6K RAM; without
remote control capabilities, 4.5K RAM. For
guest: 400K RAM; DOS 3.1 or later; *NetWare*
IPX, Version 2.1 or later.

In Short: Good administrative, diagnostic, and
support options enhance *Argus/n*
InterNetwork. Its detailed reports on LAN
workstations help with troubleshooting and
keeping track of user resources. Drawbacks
include poor documentation, the lack of a chat
feature, and the inability to do true one-to-
many and many-to-one connections, but these
are minor compared to its many valuable
features.

CIRCLE 547 ON READER SERVICE CARD



components like servers and bridges. The workstation-configuration database can relay the hardware configuration of every workstation running the host TSR, and provide information on a particular workstation's recent activity, its present status, and the programs it's currently running. You can also generate diagnostic reports of all workstations fitting the selection criteria you specify, such as all 386 CPUs.

You cannot select these criteria from the command line, but the *NetWare*-like menus will make SYSCON and FILER users feel at home. *Argus/n InterNetwork* also lets you monitor, but not control, hosts running *Microsoft Windows 3.0* in Real, Standard, and Enhanced modes. The manual says that the product has hotkey conflicts, and so we were unable to load *SideKick* from the guest. But once we loaded *SideKick* from the host, we could control it from the guest.

MULTIPLE-CONNECTION COMPROMISES

Among other drawbacks, the package does not allow one-to-many connections unless you type in a few keystrokes to disconnect from a host and reconnect to another. It also does not support many-to-one links, but daisy-chain capabilities provide the next best thing. By allowing a guest to serve as a host, *Argus/n InterNetwork* lets more than one worksta-

tion view the first host. The package does not notify hosts when their stations are monitored, and it offers no password protection. It also lacks a chat feature.

Argus/n InterNetwork passed all of the graphics and word processing trials on our LAN pass/fail tests, and was among the fastest performers on our benchmark tests. On the other hand, it generated a significant amount of traffic on the Byte Analysis Throughput performance test. A nonsynchronous program, *Argus/n InterNetwork* sends timed screen updates rather than screen changes. Although the manual says it will support bridges, the product couldn't connect a Token-Ring network and an Ethernet network across our test bridge. Triticom could not explain the failure of this connection. (Novell's *Bridge Gen* may have had something to do with this.) Interestingly, it could connect the guest to the host when using a bridge across two Token-Ring networks.

One major drawback of the package is its manual. Despite good layout, it's very difficult to find specific troubleshooting information. The lack of an index only compounds the difficulty.

Triticom offers a 90-day unconditional money-back guarantee as well as free technical support on a toll line weekdays from 8:00 to 5:30 C.S.T. The company sends all of its revision upgrades to registered users free of charge. If you wish to upgrade from *Argus/n* to the *InterNetwork* version, Triticom will credit you with the purchase price of *Argus/n*.

Argus/n InterNetwork has many strengths, especially with its administrative and support capabilities. It suffers from some weaknesses, including its documentation and the lack of true one-to-many and many-to-one capabilities. If you can live without those features, you may want to investigate this package.

Close-Up/LAN

by M. David Stone

Norton-Lambert's *Close-Up/LAN*, Version 2.5, has much in common with *Close-Up*, the company's modem-based remote program. Like its cousin, *Close-Up/LAN* is designed for support applications, offers a node-based price structure, and has such elegantly simple menus that it hardly needs a manual. The network package is

also appropriate for classroom, distributed processing, and co-computing situations. *Close-Up/LAN*'s price depends on the network configuration, costing \$395 for 2 simultaneous users, \$795 for 8, \$995 for 16, \$1,495 for 32, and \$1,995 for 64, with unlimited site licenses available.

Close-Up/LAN's ease of use starts at installation. The package includes two files, for the guest (Viewer, in *Close-Up*

Suitability to Task

Close-Up/LAN

Administrative monitoring and tracking	☐	☐	☐	☐	☐
Classroom teaching	☐	☐	☐	☐	☐
Technical support	☐	☐	☐	☐	☐

parlance) and host modules. Compatible with either NetBIOS or Novell's IPX, they automatically detect which protocol is present each time they load.

Using the program is nearly as easy. Both guest and host modules normally load as TSRs and explicitly display the hotkeys as part of their sign-on screens. You can easily redefine the hotkeys; any host can initiate a connection with any guest, and vice versa. It takes only a few keystrokes to press the appropriate hotkey, choose pull-down menu options, and enter the name or network address of the other user. The guest can hotkey from one host to the next or back to a local program. A station can also function as guest and host simultaneously.

INCLINED TO CHAT

When calling from host to guest, the package automatically pops up a chat window once the PCs connect. This makes the program easier to use in support and co-computing (or group authoring) situations.

When calling from guest to host, the package beeps a warning at the host and pops up a window asking whether it should allow the link. If the host answers no, or does not respond within 30 seconds, *Close-Up/LAN* kills the connection. A command line option lets you load the host with notification turned off, important for distributed processing applications, where you might access a dedicated system with no user present to accept the connection. With notification off, the program turns on password protection to prevent unwanted guests from logging on. You can



FACT FILE

Close-Up/LAN, Version 2.5

Norton-Lambert Corp.
P.O. Box 4085,
Santa Barbara,
CA 93140;
805-964-6767.

List Price: 2

simultaneous users,
\$395; 8 users, \$795;

16 users, \$995; 32 users, \$1,495; 64 users,
\$1,995.

Requires: For host TSR: Without menus, 9K RAM; with menus, 54K RAM. For guest TSR: 78K RAM; DOS 2.0 or later; network operating system using IPX 2.0a or later, or NetBIOS services.

In Short: Combining ease of use with flexibility, *Close-Up/LAN* handles one-to-many, many-to-one, and daisy-chain links. Lack of any support for *Windows* and EGA and VGA graphics limits *Close-Up's* usefulness; otherwise it makes a good choice for support, teaching, distributed processing, and co-computing applications.

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CONNECTIVITY LAN REMOTE CONTROL

bert declines to discuss plans for *Windows* but has already announced support for EGA and VGA graphics in its next release; at press time, no date had been set for the new version.

RAM use varies; in default mode the guest uses almost 80K and the host about 54K, but you can cut that to as little as 9K on the host if you opt to run the package without menus. *Close-Up/LAN* lacks the option to use extended or expanded memory, but Norton-Lambert claims you can load the program into high memory with *QEMM* and similar memory managers. If you have questions, the company offers free support at a toll number weekdays from 7:00 to 5:00 P.S.T.

Close-Up/LAN's lack of support for EGA graphics, VGA graphics, and *Windows* sets some limits on its usefulness. And if you need to run the program through a bridge, you should be sure to ask about compatibility first. But if you need only text and CGA graphics, the program's ease of use and flexibility of operation make it a good choice for teaching, technical support, distributed processing, and co-computing applications.

EXAC

by M. David Stone

EXAC offers a different design from most of its competitors. Instead of a guest/host metaphor, *EXAC* (the name is short for EXternal ACcess) uses a master/slave concept combined with screen-broadcasting capability. The master always controls the link, can define itself or any slave as host or guest, and can change definitions on the fly. Version 1.40 of *EXAC* costs \$495 per LAN. The manufacturer, Rose Trade International (RTI), is based in Copenhagen; it encourages customers to contact 3rd Planet Software, the authorized *EXAC* dealer in the United States. The program is particularly well-suited to classroom teaching, but can also function in nonadministrative applications like technical support, distributed processing, and co-computing.

When *EXAC* links a master to a number of slaves, the link resembles the one-guest-to-many-host type of connection found in programs like *Close-Up/LAN*. You can toggle from one slave to the next with a single keystroke, or pick a system

from the list of active slaves. Thus, the program allows one-to-one and true one-to-many control.

What distinguishes *EXAC* from other packages is that the master can designate any system, including itself, to broadcast its screen to other systems. In effect, the broadcast feature lets the master and slave

Suitability to Task

EXAC

Administrative monitoring and tracking	☐	☐	☐	☐
Classroom teaching	☒	☒	☒	☒
Technical support	☒	☒	☒	☐

trade the roles of guest and host, since slaves can view a program running on the master (or on other slaves). This feature essentially yields a many-guests-to-one-host connection, but without keyboard control from the slave guests. The program will not let you connect more than one master to any slave.

EDUCATIONAL BROADCASTING

The broadcast feature, combined with a single master in charge of the connection, makes *EXAC* particularly well-suited to classroom situations. A teacher can easily look at a student's system, change roles to show the student something, or broadcast an example to the entire class. The same features facilitate co-computing within a workgroup.

In most ways, *EXAC* is best described as minimalist. A single 38K file includes both master and slave. Each time you load the program, it automatically detects whether you are running NetBIOS or Novell IPX, and configures itself appropriately. *EXAC* requires 17K for the master TSR, 11K for a slave with broadcasting available, and 4K for a slave without broadcasting.

You can run *EXAC* by picking options from the menu or entering them as command line switches. You can also save files with the default configuration you prefer for certain situations. Options include placing the master program in resident mode, defining a password, preventing the master from sending keystrokes to a slave, disabling the indicator flag that tells a slave it's being monitored, and changing the hotkeys from the original defaults.

define a different password for each host and modify passwords without reloading the software.

The host and guest menu sets follow the same basic design, with pull-down and cascading options. They lack mouse support, instead allowing first-letter and point-and-shoot selection. Although the menus are largely self-explanatory, you can always find more information in the well-organized, clearly written manual.

Close-Up/LAN did not achieve the best speeds on our benchmark tests. The program can be set for nonsynchronous operation, but it defaults to synchronous mode, where it sends only screen changes (providing a more accurate depiction of host screen activity) and timed screen updates when there is no change. It worked over one-to-many, many-to-one, and daisy-chain connections without problems. Although the program is supposed to work over bridges, it could not transmit the *WordPerfect* macro over the Eicon bridge in our pass/fail tests. Despite consultations with Norton-Lambert, we were unable to determine the exact cause of the problem. (It's worth noting that the problem may be linked to *Bridge Gen's* inability to route certain diagnostic packets across the Eicon bridge.)

Close-Up/LAN offers a wealth of options, but some features are notably absent. It lacks support for *Windows*, whether in Real, Standard, or Enhanced mode, and for graphics beyond CGA. Norton-Lam-

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the competition
didn't plan on.

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INFO
WORLD

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Price		\$395	\$549	\$695	\$685	\$695	\$695

Performance

Features and flexibility	(175)	Satisfactory	Good	Very Good	Excellent	Very Good	Very Good
Rescheduling/resource leveling	(100)	Satisfactory	Satisfactory	Good	Excellent	Very Good	Very Good
Speed	(75)	Satisfactory	Very Good	Excellent	Very Good	Very Good	Satisfactory
Reporting	(100)	Good	Good	Good	Very Good	Very Good	Very Good
Documentation	(75)	Very Good	Good	Very Good	Very Good	Good	Very Good
Ease of learning	(100)	Very Good	Very Good	Very Good	Very Good	Good	Very Good
Ease of use	(125)	Good	Good	Very Good	Excellent	Good	Good
Error handling	(75)	Good	Good	Satisfactory	Very Good	Good	Very Good
Support							
Support policies	(50)	Good	Good	Very Good	Good	Good	Very Good
Technical support	(50)	Very Good	Very Good	Satisfactory	Excellent	Satisfactory	Very Good
Value	(75)	Satisfactory	Good	Very Good	Excellent	Very Good	Very Good
Final scores		6.0	6.4	7.1	8.7	6.8	7.1

Source: InfoWorld, November 26, 1990

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Memory (Std./Max.)	1MB/2MB	2MB/4MB	2MB/8MB (64K cache)	4MB/16MB	4MB/16MB
Hard Disk Drive	50MB	60MB	60MB	120MB	120MB
LCD/Size	Backlit 8.85"	Backlit 8.85"	Backlit 8.85"	EdgeLit 10"	EdgeLit 10"
Video/Gray Scales	VGA 16	VGA 16	VGA 42	VGA 64	VGA 64
Power Management	• Suspend/Resume • Sleep mode • Low battery operation	• Suspend/Resume • Sleep mode • Low battery operation	Premier System Management™ • Standby/Resume • Rest/Resume • Panic Save • Unattended communications	Intelligent Power Management™	Intelligent Power Management
Software	MS-DOS® included	MS-DOS included	MS-DOS pre-installed, Microsoft® Windows™ v. 3.0 included	MS-DOS and Microsoft Windows v. 3.0 pre-installed	MS-DOS and Microsoft Windows v. 4.0 pre-installed
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CIRCLE 732 ON READER SERVICE CARD

AUTOMATIC CONNECTIONS

Once you load the program at the different stations, it makes all connections automatically. Slaves have no control and no menus after configuration. The master's menu shows little more than a list of currently active slaves. You can view any slave with *EXAC* by highlighting the name and hitting the Enter key, or you can cycle



FACT FILE

EXAC, Version 1.40
3rd Planet Software
Inc., 9819 National
Bldg. #2, Los
Angeles, CA 90034;
213-841-2260.

List Price: \$495 per
LAN.

Requires: For slave
TSR: 4K RAM; with
broadcast, 11K. For
master: 64K RAM or 17K TSR; DOS 3.0 or
later; network operating system using IPX 2.0a
or later, or NetBIOS services.

In Short: *EXAC* offers an unusual program
design with a broadcast feature that lets a
single master system designate guests and
hosts on the fly. The program offers no
administrative or troubleshooting tools, but is
well-suited to classroom teaching. It can also
serve in support, distributed processing, and
co-computing applications.

Guest
EXAC

EXAC

CIRCLE 548 ON READER SERVICE CARD

through the slaves and the foreground program on the master, with a hotkey. A second hotkey turns on broadcasting of whatever screen the master station is currently viewing.

EXAC handled VGA and EGA graphics in our pass/fail tests, as well as *Windows* in Real and Standard modes (although keyboard control is available only in Real mode). *EXAC* does not allow daisy-chains, but considering its claimed ability to broadcast to 200 stations, that is not much of a limitation. According to RTI, the upcoming Version 1.41 will also support daisy-chaining. The program also presently lacks a chat window and other tools for administration and troubleshooting.

3rd Planet Software offers free technical support for *EXAC* users at a toll number weekdays from 6:00 to 5:00 P.S.T., plus bulletin-board support. *EXAC*'s combination of innovative design, simple command structure, and low RAM requirements make it a good choice for many nonadministrative tasks, especially teaching, technical support, and co-computing.

CONNECTIVITY LAN REMOTE CONTROL

Invisible Control

by Gary Bertline

For \$279 per server (or per LAN, in peer-to-peer networks), Invisible Software's *Invisible Control* demonstrates fairly speedy screen updates and arguably the best-executed installation routine of the products we reviewed. The package, which runs under NetBIOS and targets small- and medium-size networks, boasts excellent features, including dexterous translation of VGA graphics screens to EGA systems. It has a few limitations, such as its lack of remote-reboot capability.

A smart, well-organized, and thorough menu interface whips through initial installation. You can carry out each step to customize the program's functions or use the automatic procedure. Succinct, context-sensitive help saves all but the occasional pilgrimage to the manual.

USER DATABASE MENUS

You will need to create a separate database to identify each station's user, although this step is not strictly necessary on networks that follow the node-naming conventions of IBM's *PC LAN*, including Invisible Software's own *Invisible Ethernet NET/30*. But even on networks such as *PC LAN*, it's a good idea to build the database because user names selectable on the menu come from it.

Guest and host both start by running IC.COM, a reasonably memory-conscious 17K TSR. With many-to-one connections, *Invisible Control*'s group mode lets the multiple guests monitor but not manipulate a host. In a training situation, this restraint prevents the chaos of several people trying to control the same station. In a technical-support scenario, this limitation could hinder specialists at different locations from assisting a user at a host.

Suitability to Task

Invisible Control

Administrative monitoring and tracking	☐	☐	☐	☐
Classroom teaching	☒	☒	☒	☐
Technical support	☐	☐	☐	☐

The program does include a standard chat feature, however.

Invisible Control does not use passwords or read the Novell bindery. Its default state is to notify the host side when it is being monitored; the host can choose not to be notified.

Like most competing packages, *Invisible Control* cannot simultaneously display multiple host windows on-screen, but the menu offers a reasonable semblance of one-to-many operation by let-



FACT FILE



Invisible Control, Version 1.01

Invisible Software Inc., 1142 Chess Dr., Foster City, CA 94404; 415-570-5967.

List Price: Each server or LAN in peer-to-peer networks, \$279.

Requires: For host TSR: 17K RAM. For guest TSR: 17K RAM; DOS 3.1 or later; network operating system using NetBIOS services.

In Short: *Invisible Control* impresses with its smart installation routine and support of graphics translation, including VGA-to-EGA and vice versa. The product falters, mostly in small ways such as a potentially inefficient maintenance process for adding new users and the lack of remote reboot capability. But compared with other small- to medium-size NetBIOS LANs, this one does the job well.

CIRCLE 550 ON READER SERVICE CARD

ting you easily disconnect the current link and initiate another. Similarly, a station cannot act concurrently as both host and guest, but the package's support for up to 254 sessions diminishes the need for daisy-chaining. One-to-one connections posed no difficulty on our tests, even working properly over the Eicon X.25 bridge.

Two bugs turned up during the evaluation process. The menu system allowed an attempt to monitor a second host station without disconnecting the first, although the manual said this should not be possible. This supposedly illegal procedure produced a guest menu hidden behind the image of the monitored station. And in one of our tests, the program initially failed to transfer an EGA image. Invisible Software quickly issued a patch that fixed the problem. Company officials say software now shipping includes the fix; current users can download it from the support bulletin board (415-345-5509).

The program permits a guest to view a



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MODEM-BASED REMOTE CONTROL: The Serial Alternative

by Carol Ellison

Before local area networks changed the business landscape, serial versions of remote-control software provided a modem-based measure of the interactive support offered later in LAN-based remote products. These programs, still widely used, bring a form of connectivity to nonnetwork settings (see "The Next Best Thing to Being There," *PC Magazine*, June 12, 1990). Serial remote-control programs allow employees to access office PCs while working at home or traveling, or technical-support staff to troubleshoot software for customers or employees in the field without going off-site. Like their LAN cousins, the packages also can be used in co-computing situations. Some vendors sell LAN versions bundled with compatible serial versions, even when other vendors produce those serial versions.

Companies that distribute both serial and LAN versions typically give cosmetic similarities to both. Norton-Lambert's *Close-Up/LAN* shares the look, feel, and name of its PC cousin, *Close-Up*, as does Dynamic Microprocessor Associates' *pcAnywhere IV/LAN* with its serial progenitor, *pcAnywhere IV*. Brightwork Development bundles a version of Triton Technologies' *Co/Session* with its *NETremote Plus*, and the documentation in Avalan Technology's LAN product, *Remotely Possible*, gives careful instructions for using it with Microcom's serial product, *Carbon Copy Plus*.

To control security, the host PC usually uses password protection and dial-back (where the host returns the guest's call at a telephone number previously entered by the host's operator). Other common features include chat windows, data/voice switches, phone books, logs, file-transfer capabilities, automatic log-off after specified periods of inactivity on the host, the ability to disable the host's or guest's keyboard or screen, and the ability to direct printing to the host, guest, or both. Like the LAN versions, these programs often use their own terminology to describe guests and hosts.

Serial versions that lacked *NetWare* 386-compatible node-to-node versions at the time of our roundup included Microcom's *Carbon Copy Plus*, Triton's *Co/Session*, Concept Development Systems' *Line Plus*, Digital Communications Associates' *Remote2*, and SoftKlone's *Takeover*. We discuss all five here. Communications Research's *BLAST RemoteControl* offers serial remote-control features but did not arrive in time for inclusion

Serial remote programs let employees access office PCs at home or while traveling.

here. Hilgraeve also incorporates remote-control features in the latest version of its communications program, *HyperAccess/5*, Version 2.0, that go beyond the usual host features found in many competing communications programs.

THE SERIAL LINEUP

Carbon Copy Plus, the \$199 granddaddy of serial remote-control programs, hails from Microcom, the company that developed the Microcom Network Protocol (MNP) used in modems. *Carbon Copy Plus* features a wide range of terminal emulations and a universal graphics translator that allows PCs with different graphics adapters to view each other's screens.

In addition to password and dial-back security features, *Carbon Copy Plus* encrypts data sent during remote sessions. And it includes a logbook in which consultants and other people who bill for time can record calls and their duration.

Although *Carbon Copy Plus* transfers files at somewhat slower speeds

than *Co/Session* and *pcAnywhere IV/LAN*, it has held up well with age. Its only serious flaw stems from Microcom's refusal to rid it of copy protection. Although the host and guest programs come on one disk, Microcom licenses *Carbon Copy Plus* for only one PC. When the host receives an incoming call, *Carbon Copy Plus* checks its serial number against the guest's and dumps the connection if it finds a match.

Last year, Triton's *Co/Session*, \$195 for two users, became the first remote-control program to feature remote mouse support and *DESQview* compatibility. These capabilities, plus the ability to run host software in just 5K of conventional memory on PCs equipped with expanded memory, make it one of the most flexible remote-control products on the market.

With *DESQview* installed, a host user can run foreground applications while one or more guest users run applications in the host's background. *Co/Session* includes password and dial-back security features, as well as a feature to restrict the access of guests to files, drives, and directories on the host. (Triton calls the guest the support side and the host the application side.) At press time, Triton was promising June delivery of mouse support for *Microsoft Windows 3.0*, *Windows* compatibility in Real mode, and much-improved speed.

Triton also markets a script language called *Co/Session XL* that you can use to automate remote-control activities. By the time you read this, it should also be shipping a node-to-node version of *Co/Session LAN*.

NO MODEM SERVER REQUIRED

Concept Development Systems' product line provides an alternative route if you don't want to dedicate a PC to being a modem server. In addition to *Line Plus*, a serial remote-control package priced at \$199 for host and guest, Concept Development sells *Sparkle*, a LAN-based asynchronous communications program, at \$895 for the five-

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The Serial Alternative

CONTINUED

user version. Together, *Line Plus* and *Sparkle* programs allow remote callers to access nodes on a LAN through a modem attached to a workstation. A dedicated modem server is not necessary.

Line Plus includes the standard set of features you would expect in a serial remote product, along with a few bells and whistles. Its most unusual feature is a utility that works as an on-line expert system to help diagnose and troubleshoot problems commonly encountered in configuring systems for remote call-in. *Line Plus* even gives step-by-step instructions on designing cables for direct connections.

EMPHASIS ON ACCESS

Some vendors emphasize how well their products perform remote diagnostics, while other vendors emphasize training and user support. DCA stresses the usefulness of *Remote²*, \$195 for host and guest, for remotely accessing office resources. And it includes some of the advanced security features that are favored by network administrators—*Remote²*'s Guard utility lets a host user restrict the access of guests to drives, directories, and even individual files on the host.

The *Remote²* program performs error checking on all of the data that is sent during a connection and it does a commendable job with video graphics translation. It cannot translate graphics if one system is using a text-only display adapter. DCA also provides a special *Remote²* module for *Crosstalk Mk.4* users.

Takeover is one remote-control package that comes with an asynchronous communications program included. SoftKlone thoughtfully bundles its *Mirror III* (see "Asynchronous Communications Software: Improving Information Access," April 30, 1991) program with its own remote-control product.

The programs' script language, PRISM, allows users to automate guest activities and custom-design security equivalents for incoming callers. The price of this power is a somewhat steep

learning curve for novices. But organizations with a staff that has the technical expertise to take advantage of PRISM will appreciate the additional flexibility it has to offer.

The remote-control features in Hilgraeve's *HyperAccess/5*, Version 2.0, a comprehensive data communications program, are ideal for anyone who simply wants to access files and text-mode applications on a distant PC. But they are far more limited than what you will find in *Co/Session*, *Remote²*, and the other products that are mentioned here.

Unlike a true remote-control program, the *HyperAccess/5* program was not designed for user support, although it remains an ideal option for the person who occasionally needs to call in to

Some vendors
emphasize how
well their products
perform diagnostics,
while others
trumpet training
and user support.

the office to check e-mail, transfer files, or lightly edit a document or spreadsheet.

HyperAccess/5 includes security features like password protection and a virus filter for file transfers, but the program lacks interactive capabilities such as keyboard locking and screen blanking. The host software does not run in the background and the program cannot communicate screen graphics; remote callers can only run text mode applications on an 80-character by 25-line screen. ■

Carbon Copy Plus, Version 5.2
Microcom Inc., 500 River Ridge Dr.,

Norwood, MA 02062; 800-822-8224, 617-551-1000.

List Price: \$199 per copy (two copies required). **Requires:** 256K RAM (60K for host TSR), DOS 2.0 or later.

CIRCLE 634 ON READER SERVICE CARD

Co/Session, Version 5.01

Triton Technologies Inc., 200 Middlesex Turnpike, Iselin, NJ 08830; 908-855-9440.

List Price: Two users, \$195.

Requires: 5K to 105K RAM for host, 125K RAM for guest, DOS 2.0 or later.

CIRCLE 635 ON READER SERVICE CARD

HyperAccess/5, Version 2.0

Hilgraeve Inc., Genesis Centre, 111 Conant Ave., Suite A, Monroe, MI 48161; 800-826-2760, 313-243-0576.

List Price: DOS version, \$99.95; version for DOS and OS/2, \$199.00; upgrade from earlier version of *HyperAccess*, \$29.95; upgrade from any other communications program, \$39.95. **Requires:** 340K RAM for host (415K in remote operation), 340K for guest, DOS 2.0 or later.

CIRCLE 645 ON READER SERVICE CARD

Line Plus, Version 3.07

Concept Development Systems Inc., 1200 Barrett Pkwy., #14-206, Kennesaw, GA 30144; 404-424-6240.

List Price: Host, \$99; guest, \$119; both, \$199. **Requires:** 90K RAM for host, 270K RAM for guest, DOS 2.0 or later.

CIRCLE 636 ON READER SERVICE CARD

Remote², Version 2.1

Digital Communications Associates, 1000 Alderman Dr., Alpharetta, GA 30202; 800-348-3221; 404-442-4000.

List Price: Host, \$129; guest, \$89; both, \$195. **Requires:** For host: 51K to 84K RAM. For guest: 111K to 132K RAM, DOS 2.0 or later.

CIRCLE 637 ON READER SERVICE CARD

Takeover, Version 1.6

SoftKlone Distributing Corp., 327 Office Plaza Dr., #100, Tallahassee, FL 32301; 800-634-8670, 904-878-8564.

List Price: Host, \$150; guest, \$195; both, \$295. **Requires:** 70K RAM for host, 480K RAM for guest, DOS 2.0 or later.

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host running *Windows* in Real, Standard, and Enhanced modes, but not to control it. The product translates graphics images between VGA and EGA displays, unlike a fair number of competitors. An option to vary the screen-update speed also allows you to balance network load against image refresh in graphics mode. *Invisible Control* also has the advantage of defaulting to synchronous mode for text-based applications and nonsynchronous mode for graphics applications.

If you need help, Invisible Software offers free technical support 9:00 to 6:00 P.S.T. weekdays at a toll number and on its bulletin board.

Invisible Control offers some strong capabilities, such as interpretation between graphics standards and a well-conceived installation procedure. Incomplete control options and cumbersome maintenance procedures for adding new users reduce its overall benefit, particularly on a larger LAN. But the balance tips mostly in its favor, particularly because of its reasonable prices. *Invisible Control* makes a good choice for small- to medium-size NetBIOS LANs.

LAN Assist Plus

by Gary Berline

Network users sometimes need a helping hand. *LAN Assist Plus*, Version 3.0, delivers a flexible set of basic but well-implemented tools for supporting, training, or monitoring users on *NetWare* networks. Priced at \$295 per server, Fresh Technol-

One guest to many hosts refers to the product's ability to maintain true one-to-many connections, either by letting you hotkey from one host to the next, or by letting you call up a menu of active hosts, highlight a host name, and hit Enter, all without breaking the connection to the first host. Some programs also let you closely simulate one-to-many connections by choosing another host from a menu, but not before you disconnect—or get automatically disconnected—from the first host. Among the products that closely simulate true one-to-many connections are *Invisible Control*, *LAN Assist Plus*, and *NETremote Plus*.

Simultaneous multiple sessions means that the package not only lets you connect to more than one system at a time but also lets you view several hosts on-screen simultaneously.

Printer sharing and modem sharing refer to the package's built-in ability to access a printer or modem attached to a host system, which may be dedicated to that device.

CONNECTIVITY LAN REMOTE CONTROL



LAN REMOTE-CONTROL SOFTWARE: SUMMARY OF FEATURES

Products listed in alphabetical order

	Argus/n InterNetwork	Close-Up/LAN EXAC	Invisible Control
List price	\$645.00 (up to 5 network segments)	\$395.00 (2 users)	\$495.00 per LAN
NETWORK SUPPORT			
IPX	■	■	■
NetBIOS	□	■	■
SOFTWARE			
Guest/host software:			
Can operate as TSR	□ / ■	■ / ■	■ / ■
TSR can be removed without rebooting	□ / □	■ / ■	□ / □
Uses expanded memory	□ / □	□ / □	■ / ■
Uses extended memory	□ / □	□ / □	□ / □
CONNECTIONS SUPPORTED			
Many guests to one host	□	■	■
Number of guests supported with many-to-one connection	N/A	16	N/A
One guest to many hosts	□	■	■
Numbers of hosts supported with one-to-many connection	N/A	16	200
Simultaneous multiple sessions	□	□	□
Daisy-chains	■	■	□
MONITORING			
Host can initiate connection	□	■	□
Host can be notified when guest initiates connection	□	■	■
Audible notification	N/A	■	□
Visible notification	N/A	■	■
Guest or host can deactivate notification	N/A	■	■
Host can reject connection	N/A	■	□
Host can terminate connection	□	■	□
Host can restrict guest to view-only	□	■	■
Host keyboard can be disabled	□	■	■
SCREEN SUPPORT			
Program sends screen changes	□	■	■
Program sends timed screen updates	■	■	□
Update frequency can be controlled by guest/host	□ / ■	■ / □	□ / □
TROUBLESHOOTING UTILITIES			
Integrated memory mapper	■	□	□
Interrupt analysis tool	■	□	□
System performance analysis	□	□	□
Configuration report of host machine from guest	■	□	□
PROGRAM FEATURES			
File transfers	□	□	□
Printer sharing	□	■	□
Modem sharing	□	■	□
Chat mode	□	■	■
Guest's mouse works on host	□	■	□
Passwords for guest/host	□ / □	□ / ■	□ / ■

■—Yes □—No

N/A—Not applicable: The product does not have this feature.

LAN REMOTE CONTROL

[illegible]



BENCHMARK TESTS: LAN REMOTE-CONTROL SOFTWARE

With LAN remote-control software, two factors assume equal but conflicting importance: the speed with which the programs complete the tasks begun by the guest machine and the ability to view frequent screen updates on the guest.

TESTING ANALYSIS

LAN remote-control products default to one of two modes—synchronous or nonsynchronous communications. Of the products we reviewed, *Close-Up/LAN*, *EXAC*, *NETremote Plus*, and *pcAnywhere* default to synchronous operation; the other products default to nonsynchronous mode. *EXAC* does not permit nonsynchronous communications, although *Close-Up/LAN*, *NETremote Plus*, and *pcAnywhere* do. While *Remotely Possible* defaults to nonsynchronous mode, it also offers synchronous operations.

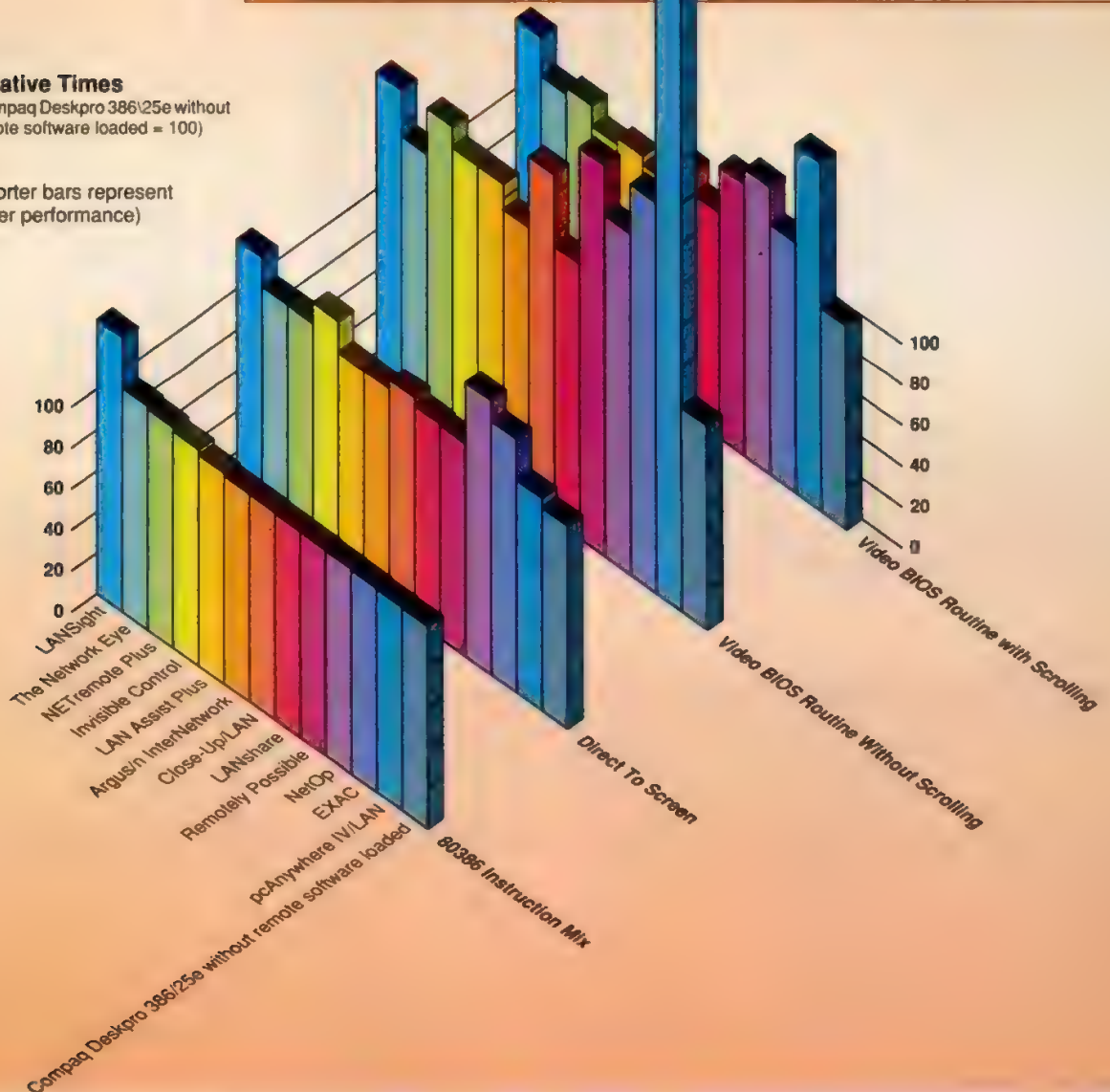
Synchronous mode is generally

preferable for viewing text applications; the product searches for any changes on the host, so the guest always receives an accurate depiction of screen activity on the host. The program generally forces an update at least once per second, even when there are no changes. In graphics applications, it would be time-consuming to view all changes from the guest on the host; the best choice would be nonsynchronous mode (where the program sends timed screen updates rather than changes). Nonsynchronous mode lets the guest view fewer

Relative Times

(Compaq Deskpro 386/25e without remote software loaded = 100)

(Shorter bars represent better performance)



intermediate screens rather than every change that may occur; typically, a program will update the screen eight times per second. *Invisible Control* cleverly handles the situation by defaulting to synchronous mode for text and nonsynchronous mode for graphics displays.

Viewing every change made on a host user's text-based application is not always crucial, however. For instance, if you are a supervisor monitoring an employee's work habits, it may be enough to view only a few screens of the application in use on

the host. For technical-support staff and teachers in a classroom situation, where the guest must actually control the host machine, it may be more important to use synchronous connections to see exactly what is happening on the host screen.

On our tests, nonsynchronous products like *Argus/n InterNetwork*, *LAN Assist Plus*, and *LANshare* were among the top performers. Products that defaulted to synchronous mode tended to provide slower results on our benchmark tests than these nonsynchronous programs. By sending

more information to the guest and allowing more information to be seen on it, a synchronous program creates more overhead on the host. *Close-Up/LAN*, *EXAC*, *NETremote Plus*, and *pcAnywhere IV/LAN* provided some of the slowest results on our tests. (Interestingly, the nonsynchronous *Network Eye* was also a slow performer, as were *NETOp* and *LANsight*.) Switching to nonsynchronous mode on products that allow it will improve the speed, but—as with products that default to nonsynchronous mode—will transmit less information.

Performance Times

(Lower scores represent better performance)

	80386 Instruction Mix Elapsed Time (seconds)	Direct To Screen Elapsed Time (seconds)	Video BIOS Routine Without Scrolling Elapsed Time (seconds)	Video BIOS Routine with Scrolling Elapsed Time (seconds)
LANsight	3.20	1.37	0.77	1.98
The Network Eye	2.60	1.21	0.66	1.70
NETremote Plus	2.57	1.21	0.77	1.75
Invisible Control	2.52	1.32	0.72	1.60
LAN Assist Plus	2.46	1.15	0.72	1.65
Argus/n InterNetwork	2.43	1.15	0.66	1.59
Close-Up/LAN	2.43	1.20	0.83	1.81
LANshare	2.42	1.16	0.66	1.64
Remotely Possible	2.42	1.15	0.94	1.98
NetOp	2.41	1.48	0.82	2.09
EXAC	2.40	1.37	0.94	1.82
pcAnywhere IV/LAN	2.39	1.15	2.05	2.53
Compaq Deskpro 386/25e without remote software loaded	2.38	1.10	0.49	1.48

■ The **80386 Instruction Mix** benchmark test times a series of tasks specific to the 80386 chip. With LAN remote-control software loaded, this test measures the overhead that the host system incurs during nonscreen processing. A faster time indicates better performance of the host software when the screen is not being changed.

■ The **Direct to Screen** benchmark test indicates the speed of the video memory. Remote-control software that can detect direct-screen writes (that is, operate in synchronous mode) will send the screen images to the guest system more frequently than software that sends screens at timed intervals. A faster time indicates less degradation of host-system performance but also means fewer notifications of changes to the guest system.

■ The **Video BIOS Routine Without Scrolling** benchmark test measures how quickly the video BIOS writes text to the screen. The test writes to the screen without causing the screen to scroll. Remote-control programs that can detect BIOS writes will maintain better synchronization between the host and guest systems but yield slower times. The nonsynchronous programs that send screens at fixed intervals will give faster times but provide fewer notifications of changes to the guest system.

■ The **Video BIOS Routine with Scrolling** benchmark test measures how quickly the video BIOS writes text to the screen. The screen scrolls up before each line is written. This test is similar to the Video BIOS Routine Without Scrolling test, except that the scrolling of the screen can cause some remote-control programs to send full screen updates to the guest instead of partial updates.

HOW WE TESTED

The LAN test-bed consisted of two Compaq Deskpro 386/25e workstations, each with 4MB of installed RAM. The workstations used 16-bit Proteon 4-megabit-per-second Token-Ring adapters; the network operating system was Novell's *NetWare 386*, Version 3.1. The server was a Compaq Systempro with a 386 processor running at 33 MHz; it included 8MB of RAM, an array of four hard disks with a total capacity of 840MB, and a Compaq EISA Token-Ring adapter.

All the workstations attached to the *NetWare* server used Novell's IPX 3.0A shell. When the product required, we used the Novell NetBIOS emulator in conjunction with IPX. We tested all products in the default mode—synchronous or nonsynchronous. *Close-Up/LAN*, *EXAC* and *pcAnywhere IV/LAN* defaulted to synchronous mode. Except with *EXAC*, the guest can choose to run the program using synchronized or nonsynchronized screen updates.

PC Magazine Labs' computer benchmark tests were designed to measure the processor and video capabilities of various PCs. We used these tests to determine the overhead each remote package placed on the processor and the video memory. We also ran each test on a single Compaq Deskpro without any remote-control software loaded in order to discover how much the monitored PC's foreground program performance degrades with remote-control software loaded.



PERFORMANCE TESTS: LAN REMOTE-CONTROL SOFTWARE

The products that generate less network traffic transmit changes only as they occur or compress the data going across the line. Those that create more traffic, while they may perform faster, can lower throughput for other network operations.

TESTING ANALYSIS

On the Byte Analysis test, *pcAnywhere* IV/LAN, *NETremote Plus*, *Remotely Possible*, and *NetOp*, performed best because they produced the least network traffic. Products such as these use the network more efficiently, either by compressing data or by sending only changes.

Many products with less impressive results captured the screen image and dumped the information onto the cable a number of times per second, whether it had changed or not. With this method, the same operations generate more traffic. If you have many stations running programs that use this less efficient but faster technique, you may create so much traffic on the network that you will decrease the throughput of normal network operations, such as data queries. Programs such as *The Network Eye*, *Argus/n InterNetwork*, *LANshare*, and *LAN Assist Plus* use the continual-update method to ensure that they transmit the images to their guests with no changes lost. Some programs, such as *Invisible Control*, can employ both techniques, one as the default and the other as a safety valve.

(Lower scores represent better performance)

Byte Analysis Throughput (bytes per minute)

Workstation using IPX (no remote software loaded)	320
Workstation using NetBIOS (no remote software loaded)	320
pcAnywhere IV/LAN	666
NETremote Plus	614
Remotely Possible	969
NetOp	1,035
Invisible Control	1,165
Close-Up/LAN	1,361
EXAC	2,357
LANsight	107,322
LAN Assist Plus	149,118
LANshare	563,137
Argus/n InterNetwork	723,396
The Network Eye	2,604,520

■ For the Byte Analysis test, we loaded the host and guest programs on two PCs and then, using *Watchdog*, measured the amount of network traffic generated by each remote-control package station during 1 minute of use. Smaller numbers indicate that the product creates less traffic on the LAN. We report the results in bytes per minute.

HOW WE TESTED

The LAN test-bed for remote-control software consisted of two Compaq Deskpro 386/25e workstations, each with 4MB of installed RAM. The workstations used 16-bit Proteon 4-megabit-per-second Token-Ring adapters; the network operating system was Novell's *NetWare 386*, Version 3.1. The server was a Compaq Systempro with a 386-based processor running at 33 MHz; it included 8MB of RAM, an array of four hard disks with a total capacity of 840MB, and a Compaq EISA Token-Ring adapter.

The workstations attached to the *NetWare* server used Novell's IPX 3.0A shell. When the product required, we used the Novell NetBIOS emulator in conjunction with IPX. We tested all remote-control products in the default mode—synchronous or nonsynchronous.

For our Byte Analysis test, we used *Network General's* Token-Ring *Watchdog* program to monitor the amount of network traffic generated by each product. We first ran the Byte Analysis test on two idle PCs attached to the server, allowing us to compare the increase in network traffic when a remote program was in use. Each workstation shell using IPX or Novell's NetBIOS emulation product will generate 320 bytes per minute of traffic, just to allow itself to be part of the network. We include that information in the chart for comparison.

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The product ignores NetBIOS-based LANs to concentrate instead on tight integration with Novell's operating system. All menus present an enhanced C-Worthy interface, home turf for any SYSCON jockey.

SECURITY FROM THE BINDERY

LAN Assist Plus's use of functions that access the Novell bindery—the database used to monitor *NetWare* resources—makes the program relatively simple to set up or modify. Its use of the bindery ensures that network security restrictions remain in place. Default settings for all program options, including remote reboots and daisy-chains, appear on a simple menu. You can override the default choices with command line switches whenever necessary.

The setup utility employs bindery services to build lists of users, groups, and

attached servers. By selecting from the lists, you can quickly assign users or groups to act as guests of a particular host. Some competing products force you to create and update the roster by hand, often a daunting task.

You can assign guests one of three access levels. Assist gives complete control over manipulating host screens, while View allows no remote abilities beyond viewing the host's screen. Chat restricts hosts and guests to simply exchanging messages.

A flexible security arrangement lets you set guest privileges from the configuration menu, the command line, or even SYSCON. The SYSCON method provides a clever means of assigning guest access, not only with respect to existing hosts but also future ones.

Guest mode, when run as a 32K TSR or a standard application, displays an informative menu showing hosts, network and node addresses, rights, and available options. Watch out for one small curve: The

program does not dynamically update status information. If any user logs off, you will find out only by exiting and reentering the menu.

Command line parameters let guests bypass menus and connect to a user by log-on name, or to a station via the network and node address. Like most such

Suitability to Task

LAN Assist Plus

Administrative monitoring and tracking	☐	☐	☐	☐
Classroom teaching	☒	☒	☒	☐
Technical support	☐	☐	☐	☐

software, host mode starts from the DOS prompt. It runs in the background as a 5K TSR (8.5K with the chat window). Mnemonic switches provide access to configuration options.

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NETWORK PERSONAL

LAN Assist Plus generated more than its fair share of network traffic on the Byte Analysis Throughput performance test. The product, which operates in nonsynchronous mode, was a speedy performer on the PC Magazine Labs benchmark tests. Setting the guest's /Q option makes screen updates flash by nearly twice as fast, but increases network traffic and slows down the processing on the host

CONNECTIVITY LAN REMOTE CONTROL

when an EGA guest views a graphics screen from a VGA host.

Excepting that, *LAN Assist Plus* suffers no major flaws. Fresh Technology supplies free support by phone on weekdays from 7:00 to 6:00 M.S.T. and by bulletin board. *LAN Assist Plus* is a quick and neat utility that's easy on RAM, light on your wallet, and well-suited to supporting *NetWare* users.

LANshare

by Sheryl Canter

LANshare, from MicroNet, provides many-to-one connections on any network running NetBIOS at the low cost of \$259.95 per LAN. As many as 16 guest workstations can connect to a single remote host and share control. These capabilities allow simultaneous group authorship of documents and spreadsheet files. If you want a chat facility, which can be helpful for co-computing activities, your network will have to provide its own. The package supports daisy-chains but lacks true one-to-many capability.

LANshare is not difficult to install but operating it can be tricky. Loading the *LANshare* TSR onto a workstation assigns the station a network name and allows it to act as a host until you reboot. The menu-based TSR host program requires 12K. You initiate connections from a guest workstation by typing LANCALL at the DOS prompt. The guest module requires 40K RAM and is not memory-resident. Because of how NetBIOS works, when operating as a guest you must use a network name other than the one you used when you logged on as a host. Although this may be intuitive to those familiar with NetBIOS, the manual does not mention it. An update to the manual might be in

Suitability to Task

LANshare

Administrative monitoring and tracking	☐	☐	☐	☐
Classroom teaching	☒	☐	☐	☐
Technical support	☒	☒	☐	☐

order: The company has not released a new version of the program or the documentation since our last review, nearly two years ago ("The LAN's Helping Hand," October 31, 1989).

With this product, the guest decides what information gets transferred across the LAN. The guest machines use nonsynchronous mode to sample the host ma-

FACT FILE

LAN Assist Plus, Version 3.0

Fresh Technology Co., 1478 N. Tech Blvd., #101, Gilbert, AZ 85234; 602-497-4200.

List Price: \$295 per server.

Requires: For host TSR: Depending on use of chat window, 5K RAM to 8.5K RAM. For guest TSR: 32K RAM; DOS 3.1 or later; *NetWare*, Version 2.0a, or *NetWare* 386, Version 3.11.

In Short: Requiring minimal memory to support unlimited users, *LAN Assist Plus* offers simple operation at an excellent price. It lacks diagnostic abilities and can't translate graphics from VGA to EGA, but it implements basic across-the-LAN remote features well, so it's a good choice for *NetWare* networks.

CIRCLE 601 ON READER SERVICE CARD

slightly. Guest control of a host running *Windows* extends to the keyboard, but only if the host runs *Windows* in Real mode. (You can view a host running *Windows* in Enhanced mode, however.)

MANY CONNECTION OPTIONS

For the most part, the Fresh Technology package connects guests and hosts with no trouble, whether they are on the same LAN or split over an Eicon X.25 bridge. The product handles one-to-one and many-to-one connections easily. One-to-many links require disconnecting from the first host before viewing the next, but you can switch to the desired host fairly quickly. Daisy-chaining works flawlessly, but you will rarely need it since the software places no limit on the number of connections. Adding a companion utility, *Remote Console*, even lets you control *NetWare* file servers across the LAN.

The software has no diagnostic features, and the manual could use a glossary and explanations of error messages. But the program's biggest fault lies in its failure to do any sort of graphics translations from higher to lower resolutions, such as

FACT FILE

LANshare, Version 2.0

MicroNet Inc., 2356 Parkside Dr., Boise, ID 83712; 208-384-9137

List Price: \$259.95 per LAN.

Requires: For host TSR: 12K RAM. For guest: 40K RAM; DOS 3.1 or later; network operating system using NetBIOS-compatible services.

In Short: At a good price, *LANshare* provides many-to-one connectivity for networks running NetBIOS. Although a chat feature would help its co-computing functions and the program lacks one-to-many capabilities, *LANshare* works without glitches and with low memory overhead.

CIRCLE 602 ON READER SERVICE CARD

chine a number of times per second. Other packages use an algorithm that decides whether to refresh the entire screen or just update the changes, depending on the circumstances.

The host can set up several security parameters, including a list of acceptable guests and a prompt that pops up on-screen when a guest tries to connect, asking for consent from the host. A host can also configure the length of time the prompt stays on-screen and decide whether to let the guest just view the screen or also manipulate it.

On most networks, the system manager can override these options. And if a request for access pops up on your host screen, it's easy to forget you are being monitored because the program has no continuous audible or visible signal.

LANshare successfully transmitted our *WordPerfect* macro across the Eicon X.25 bridge, but not our graphics image. You can view hosts running *Windows* in Real, Standard, or Enhanced mode, but cannot control them. *LANshare* ranked among the better performers on our benchmark tests in terms of speed—as with all nonsynchronous programs, the cause was less overhead on the host PC.

AN ALTERNATE APPROACH

Although the *LANshare* package does not directly support connections from one guest to many hosts, the manufacturer suggests that users can achieve one-to-many connections by running *LANCALL* in separate DOS windows under *Windows*. This would probably have been an acceptable solution for many users; unfortunately, we could not make it work on our own test-bed. Micronet suggested some changes to the *Windows* settings, but ultimately we could not resolve the one-to-many problem.

LANshare comes with several additional utilities that let you view all workstation names, see who's monitoring you, and remotely reboot a host. The reboot utility displays a warning message telling you that you are about to reboot *this* machine. This can be somewhat confusing at first, since you are working on the guest machine and the utility reboots only the host. If you find the utilities resetting your screen colors when you exit to DOS, you might want to run them from a batch

file with the appropriate *MODE* command at the end.

MicroNet offers technical support—for a fee—weekdays at a toll number from 9:00 to 4:00 M.S.T.

At \$259.95 per LAN, *LANshare* has a reasonable price tag. It reliably accomplishes its main function of enabling multiple guests to monitor and control one host without glitches. Although this package is inconvenient in some ways, it may be worth a look if the many-to-one connection capability is all you really need for your LAN.



PASS/FAIL PERFORMANCE TESTS: LAN REMOTE-CONTROL SOFTWARE

LAN remote-control software is still a maturing product category. Of the 12 packages reviewed, only two passed all pass/fail tests with flying colors.

LAN remote-control packages should let the guest's keyboard transparently control the host so that both machines appear to act as one unit. These pass/fail tests assess how well the packages perform this task under various conditions.

We tested the products over a local area network and a wide area network. On the LAN tests, all successfully ran the *WordPerfect* macro from the guest machine, and all but two could handily view a graphics image transmitted between two VGA-equipped systems (*Close-Up/LAN* does not support graphics above CGA, and *The Network Eye* works only with character-mode programs). Sending an image from a VGA host to an EGA guest was a little trickier for some products than transmitting an image from an EGA host to a VGA guest or passing images between two systems with like displays.

Generally, both the host and guest modules can operate as TSRs. The majority of programs passed the TSR test, which assesses the potential for conflict between the remote-control software's host TSR and a popular TSR program such as *Sidekick*, when you load *Sidekick* from the guest. Most problems occurred when the remote program could not accept the hotkey the guest used to initiate the TSR on the host. While some products had a problem calling up *Sidekick* on the host from the guest, they could often control it on the guest when it was loaded from the host. This did not suffice to pass.

We also tested the products' ability to work with hosts running *Microsoft Windows* 3.0. The ability to control a host is an

important aspect of these products, but not all of them could pass the Alt keystrokes (needed to control *Windows*) from the guest machine to the host. *EXAC*, *LAN Assist Plus*, *NetOp*, *pcAnywhere IV/LAN*, and *Remotely Possible* did pass the Keyboard Control test. Because most of the products cannot control *Windows*, you should note those that at least allow you to view *Windows* on the host. (Only one product could control a mouse under *Windows* on the host: *Remotely Possible*.)

On the wide area network tests, many products were able to transmit both the graphics image and the *WordPerfect* macro. While *The Network Eye* makes no claims for being able to perform over a bridge, it too was able to transmit the test macro in our tests.

We also tested the ability of these products to use a mouse attached to the guest PC to accomplish functions on the host PC in a non-*Windows* environment. This test was conducted using a Microsoft Mouse and *Cpanel*, a diagnostic and tuning program. None of the products, including *Remotely Possible*, passed this test, so we do not chart the results. *Remotely Possible* used a mouse successfully on a host with applications like *Microsoft Word*.

NetOp and *pcAnywhere* were the only programs to pass every test. (*NetOp* had the advantage of being able to operate in Enhanced-mode *Windows*.) *EXAC*, *LAN Assist Plus*, *Invisible Control*, and *LAN-Sight* also passed most tests. Although they didn't fail any, they lacked support for some of the features we tested.

HOW WE TESTED

The LAN test-bed consisted of three Compaq Deskpro 386/25e workstations, each with 4MB of installed RAM. The workstations used 16-bit Proteon 4-megabit-per-second Token-Ring adapters; the network operating system was Novell's *NetWare* 386, Version 3.1. One of the workstations

was equipped with an EGA monitor for compatibility testing; all others used VGA monitors. The server was a Compaq Systempro with a 386 processor running at 33 MHz; it included 8MB of RAM, an array of four hard disks with a total capacity of 840MB, and a Compaq EISA Token-Ring adapter. All the workstations attached to the *NetWare* 386 server used Novell's IPX 3.0A shell. When required by the product, we used the Novell NetBIOS emulator in conjunction with IPX.

For all the graphics tests, we used the *Cshow* program to display a .GIF image of a frog in 16 colors.

The WAN test-bed involved two Compaq machines on separate networks. In one, we replaced the Token-Ring card with a 3C503 Ethernet card. We installed an Eicon X.25 bridge in the two PCs, along with Novell's *Bridge Gen*, to transfer data from the Token-Ring network to the Ethernet network. To connect the bridge PCs, we used a null-modem cable as a simulated phone line. The host PC resided on the Token-Ring side of the bridge; the guest PC was on the Ethernet side. The bridge speed was set at 56 Kbps.

At this time, *Bridge Gen* cannot route certain diagnostic packets across the Eicon X.25 bridge. Keep in mind that the products that failed the pass/fail WAN tests may have done so because of this router flaw. Novell is aware of the problem and is working on a solution.

Where not otherwise stated, we ran the tests using 640-by-480 VGA displays on both systems. Except where noted, a passing grade on any LAN or WAN test means that the product behaved exactly as if you were running it on a local machine. Any loss of features or capability, such as a crash when exiting from *Windows*, resulted in the product failing. If the product claimed to support a feature and didn't on our tests, it failed. An N/A appears for a product that did not claim to support a feature we were testing and was not able to support that feature.

LANsight

by Sheryl Canter

LANsight gives you a bird's-eye view of the LAN. Version 2.0 of LANSystems' package provides extensive diagnostic and monitoring capabilities, a chat feature, file transfers, and one-to-one connections, at a cost of \$395 per server.

LANsight runs only on Novell IPX networks, and is somewhat unusual in that it does not support true one-to-many or

many-to-one connections; you can connect only two workstations at a time. To simulate true one-to-many links, you need to disconnect from your current host and go through a few menus to select a new host. *LANsight* is mainly designed for network administrators who need to monitor, diagnose, and control all aspects of the LANs they manage, not for teaching applications.

The package is a breeze to install; its menu-driven interface has a solid look

and feel. You set global security parameters by running a special utility stored locally at the network manager's workstation. The supervisor can set the network's log-on password, user permissions, access rights lists, and audible or visible signaling. To allow access, the host must run a small TSR, taking 4K of RAM. A second 4K TSR lets the guest hotkey into monitoring mode. You can easily remove both of the TSRs from memory without rebooting.

You can invoke a third program called *Sight* (which requires between 220K and

LAN TESTS

The LAN **VGA-to-VGA Graphics** test assesses the product's ability to display, on the guest, the .GIF graphics image running on the host. To pass, it had to display the image on the guest with all 16 colors. Palette colors did not have to match exactly, as long as visual details were maintained.

The LAN **VGA-to-EGA Graphics** test assesses the product's ability to display, on a guest machine with

a 640-by-350 EGA display, the .GIF graphics image running on a host machine with a VGA display. To pass, it had to display the image on the guest with all 16 colors. Palette colors did not have to match exactly, as long as visual details were maintained.

The LAN **EGA-to-VGA Graphics** test assesses the product's ability to display, on a guest machine with a VGA display, the .GIF graphics image running on

a host machine with a 640-by-350 EGA display. To pass, it had to display the image on the guest with all 16 colors. Palette colors did not have to match exactly, as long as visual details were maintained.

The LAN **WordPerfect Macro** test uses a *WordPerfect* macro designed to simulate the typical use of a word processor, employing its spell-checking, block-and-move, page-up, page-down, Function, Alt, and Ctrl features. We ran the macro on the host via the guest. A product passed if the macro was able to complete its tasks successfully.

The **TSR** test determines whether a conflict occurs among the guest TSR, the host TSR, and other memory-resident programs. If we could load *Sidekick* from the host and use it on the guest, the product passed.

The **Reboot** test assesses the product's ability to reboot the host machine from the guest system.

	VGA-to-VGA Graphics	VGA-to-EGA Graphics	EGA-to-VGA Graphics	WordPerfect Macro	TSR	Reboot	View Only	Keyboard Control	VGA-to-VGA Graphics	WordPerfect Macro
Argus/n InterNetwork	P	P	P	P	N/A	P	E	F	F	F
Close-Up/LAN	N/A	N/A	N/A	P	P	F	N/A	N/A	N/A	F
EXAC	P	P	P	P	P	P	S	R	N/A	N/A
Invisible Control	P	P	P	P	N/A	N/A	E	N/A	P	P
LAN Assist Plus	P	N/A	P	P	P	P	E	R	P	P
LANshare	P	P	P	P	N/A	P	E	N/A	F	P
LANsight	P	P	P	P	P	P	N/A	N/A	P	P
NetOp	P	P	P	P	P	P	E	E	P	P
NETremote Plus	P	N/A	F	P	F	P	N/A	N/A	P	P
The Network Eye	N/A	N/A	N/A	P	F	P	N/A	N/A	N/A	P
pcAnywhere IV/LAN	P	P	P	P	P	P	E	R	P	P
Remotely Possible	P	N/A	P	P	P	P	E	E	F	F

LAN Tests

Windows 3.0

WAN Tests

P — Pass
F — Fail
R — Real mode
S — Standard mode
E — Enhanced mode
N/A — Not applicable

WINDOWS 3.0 TEST

The **View Only** and **Keyboard Control** tests assess the product's ability to support *Microsoft Windows* 3.0. We ran *Windows* from the guest machine on the host in Real, Standard, and Enhanced mode. The chart specifies the highest mode at which the product was able to operate. If the guest screen was identical to the host screen (only very slight variations in color were acceptable), the product passed.

WAN TESTS

The WAN **VGA-to-VGA Graphics** test operated in the same manner as the LAN **VGA-to-VGA Graphics** test, with the exception that the guest and host machines were on separate networks connected with a bridge. To pass, the guest machine had to display the image with all 16 colors. Palette colors did not have to match exactly, as long as visual details were maintained.

The WAN **WordPerfect Macro** test operates in the same manner as the LAN **WordPerfect Macro** test, with the exception that the guest and host machines were on separate networks connected with a bridge. A product passed if the macro was able to complete its tasks successfully.

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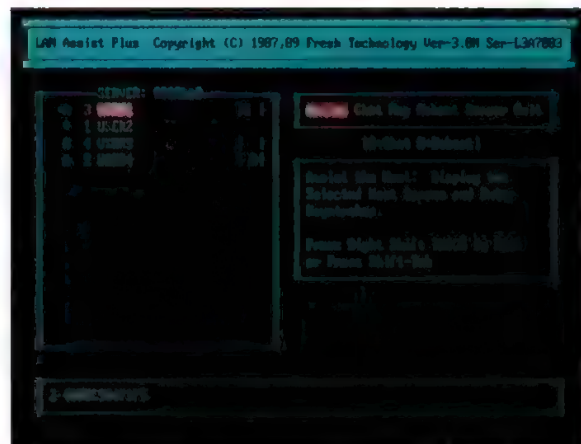


LAN REMOTE-CONTROL SOFTWARE: Screens With a View

The guest modules on LAN remote-control packages typically offer menus with a wide variety of choices. These options can range from diagnosing workstation problems to chatting with a monitored user. Some packages emphasize their compatibility with *NetWare* by using the C-Worthy menu interface employed by Novell in familiar *NetWare* utilities like SysCon and PConSOLE. A guest user sees these screens when deciding how to set up the package, connect to a host, or conduct the current session. Other programs concentrate less on features like administrative monitoring and tracking of hosts or diagnostic menu options, and offer exciting multiwindow views of a series of connected host screens instead.



Invisible Control users all see the menu shown. Individuals become guests by picking Monitor a User from the Functions window. Many-to-one connections require guests to join a group, accomplished by all guests selecting the same host and choosing Join a Group. The host becomes a Group Master by default and may accept or reject requests to join, or terminate current members. Enable Privacy allows any user to prevent monitoring by another user.



The *LAN Assist Plus* Viewer menu, using a C-Worthy interface, allows command selection from the upper right-hand box. The window to the left exhibits user choices and information, with the current server at the top. In the user information area, columns display, from the left, the guest's access level (view, chat, or full control), the user's connection number and log-on name, and indicators that show whether the host TSR is running, and in what mode. The long bottom window shows the user's network and node number.



NetOp lets you simultaneously view multiple hosts on-screen, hotkey among them, and move their windows to different positions. If you like, you can zoom in on one of the host screens and expand it to a full screen on the guest display. Broadcast mode lets an unlimited number of guests connect with one host and view its screen.



Close-Up/LAN's elegantly simple menus (shown in detail) have a cascading pull-down design. From the guest

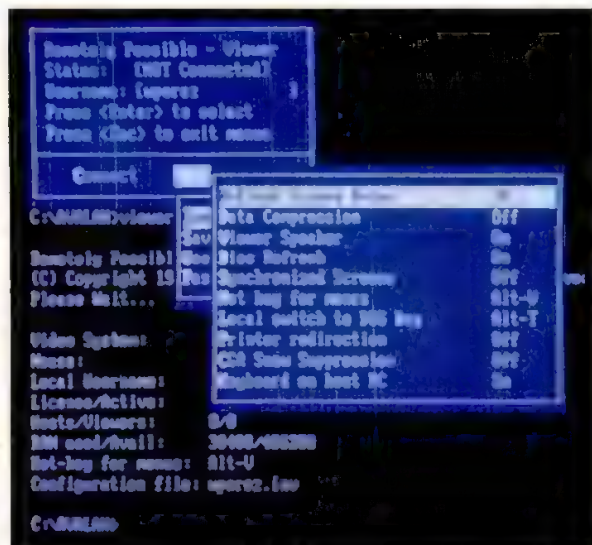
(or viewer, as the package terms it), you enter the name or network address of the host to which you would like to connect. You can hotkey from one host to another, or to a program running locally.

CONNECTIVITY LAN REMOTE CONTROL



NETremote Plus focuses on administrative and support functions. The program's first step when connecting with a system is to display a configuration summary for that system, including items such as its network address, the video display in use, and its memory capacity. The program also allows you to control that PC, view more detailed configuration information, or run diagnostic tests.

pcAnywhere IV's remote (guest) main menu is one of three primary menus, the other two being the host main menu and the main menu. From here, you can connect to a host or gather information about it. The program is rich in options, with three dots indicating that each alternative leads to another menu. The terminal/direct connect option lets **pcAnywhere IV** act like a standard communications program.



Remotely Possible is unique in allowing users to view and control **Windows** hosts not only via the keyboard but also by using a mouse. Easy-to-use menus offer options such as redirecting printing to the guest system or running DOS applications while remotely controlling the host.

512K) as a menu selection after hotkeying into guest mode, or by typing a command at the DOS prompt. When you execute **Sight**, a menu system pops up and gives you access to **LANsight's** many features, including file transfers and chat mode. Unfortunately, the program does not save the connection options on the guest machine (such as its video-speed settings) once you exit; this forces you to reenter often-used settings each time you access **Sight**. **LANSystems** says it will correct this inconvenience in a future release of the product.

Suitability to Task

LANsight

Administrative monitoring and tracking	☒	☒	☒	☒
Classroom teaching	☒	☐	☐	☐
Technical support	☒	☒	☒	☒

LANsight, which uses a smart algorithm for video transmission, generated a considerable amount of network traffic on our Byte Analysis Throughput test. On our benchmark tests, despite operating in nonsynchronous mode, it was somewhat slower than some of its competitors. The program is not designed to handle hosts running **Microsoft Windows 3.0**. **LANSystems** acknowledges the possibility that **LANsight** may be able to view a host running **Windows**; however, the docu-

LANsight's diagnostic capabilities provide you with a bird's-eye view of the LAN.

mentation cautions that the product is unreliable in this environment, particularly when **Windows** is operating in Enhanced mode. **LANSystems** plans keyboard and mouse control of **Windows** hosts for the next release. On our benchmark tests, we could view **Windows**, but the host crashed upon exiting.

While **LANsight** can get around the one-to-one connection limit by daisy-

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FACT FILE

LANSight, Version 2.0

LANSystems,
300 Park Ave. South,
New York, NY 10010;
801-373-1645.

List Price: \$395 per
server.

Requires: For host
TSR: 4K RAM. For
guest: 4K RAM TSR
or 220-512K RAM; DOS 3.1 or later; *NetWare*
286, Version 2.1 or later, or *Netware 386*,
Version 3.1 or later.

In Short: *LANSight* supports only one-to-one
connections, but it is well-constructed and
easy to use. Its strengths lie in the facilities it
provides to network administrators. Offering
extensive network monitoring, diagnostic, and
control features, it also benefits from file-
transfer and chat capabilities.



CIRCLE 603 ON READER SERVICE CARD

chaining, its real strengths are in its extensive diagnostic and monitoring capabilities. *LANSight* gives you access to the configuration of any computer on the network, including the machine's CPU type, math coprocessor, memory map, ROM extension information, CMOS

CONNECTIVITY

LAN REMOTE CONTROL

setup, open files, printer ports, print-capture information, device drivers, mouse support, BIOS date, DOS version, and interrupt vector table.

TRAFFIC MONITOR

LANSight also lets you monitor the traffic on the network, giving detailed speed and error information for network administrators trying to fine-tune their LANs' performance and pinpoint the source of problems. Although a brief overview in the manual explains how *NetWare* transmits messages, it also shows statistics that assume a high level of knowledge on the part of the user.

The manual is generally clear and well-written, but a little clumsy to use. If you need help, you can get free technical support from LANSystems on weekdays from 9:00 to 7:30 E.S.T. at a toll-free number. The company also operates a bulletin board.

Since *LANSight* does not offer the capability of one-to-many or many-to-one connections, it has limited use for in-house training. (LANSystems sells the

\$595 *LANSchool* for that purpose, but gears that package towards the educational market more than the corporate environment.) *LANSight* was designed with one purpose: to be a useful tool for the network administrator. Its abilities to monitor and control remote hosts and to

***LANSight* is for the
administrator who
needs to monitor and
control every aspect
of the network.**

view workstation configurations enable administrators to help LAN users encountering problems. For network administrators who need to be able to monitor and control every aspect of their networks, *LANSight* is one program that fits the bill perfectly.

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CIRCLE 495 ON READER SERVICE CARD

NetOp

by Sheryl Canter

Not everything is rotten in the state of Denmark. A Danish company called Danware has produced *NetOp*, a powerful LAN remote-control package with true one-to-many capabilities. International Intergroup distributes the *NetOp* program in the United States, where it retails for \$695 per LAN.

Its many features include letting you view multiple hosts on a guest screen simultaneously, which few other packages can do. In broadcast mode, an unlimited number of guests can view one host, rather than the usual limit of 16 guests found in other packages. *NetOp* also does a good job transmitting graphics. Additionally, the TSR that enables workstations to be hosts takes up only 1K under NetBIOS (or 2K under IPX or the NetBIOS emulator from Novell).

Unfortunately, *NetOp* has a compatibility problem using IPX with *NetWare 386*, Version 3.1 and later. Because we had Version 3.1 installed, we had to run all our tests over the NetBIOS emulator instead of

IPX. Novell confirmed that in Version 3.1 it changed some of the advanced *NetWare* calls used by *NetOp*; Danware plans to correct the compatibility problem soon. If you are using an earlier version of *NetWare*, you can run *NetOp* over IPX.

You can prepare workstations to act as hosts by running a tiny TSR of 1K to 2K at boot time. On the guest station, *NetOp* requires that you remain inside the subdirectory where it's installed. The guest program, which requires 250K, has no hotkey capability; you execute it at the DOS prompt.

MULTIPLE VIEWS

NetOp has the relatively unusual capability of viewing multiple hosts simultaneously on the guest screen, while a zoom option expands the selected host screen to full size. The guest can then hotkey between hosts.

A red square in a corner of the host screen or an audible signal when in graphics mode notifies you when a guest is monitoring you. When the guest breaks the connection, the square turns green; it

D U M L A L C I H E
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L O O K I N G W V I
O A F Z P C M X G E
F H E O A Y M O P Z
Z G K B R Y O Z I A
P I J U Z P T H O U
V O I A D O B E N X
D M J L I V O D T V
R A H O E A U X R N
F G E M O I K X Y P
W G U O A E I L Z Z
P V H O J X E N E C
E Z E I G H T X Y M

CONNECTIVITY

LAN REMOTE CONTROL



TAGS FILE



NetOp

Version 2.2b

International Intergroup

Ltd., 1777 S. Hamson

St., #500, Denver, CO

80210; 303-692-9090.

List Price: \$695 per

LAN. Requires: For

host: 250K RAM. For

guest: 1K RAM to 2K RAM; DOS 2.0 or later;

network operating system using NetBIOS- or

IPX-compatible services. In Short: *NetOp* offers

many useful capabilities, including one-to-many

connections viewed simultaneously on the guest

screen, and remote keyboard control of Windows

applications. But networks running *NetWare 386*,

Version 3.1 and later, will need to run *NetOp*

under NetBIOS until the manufacturer resolves

compatibility problems.

CIRCLE 604 ON READER SERVICE CARD

scrolls off when you press Enter. A green square can warn that someone was accessing your workstation while you were away from your desk. Notification cannot be turned off.

NetOp can also broadcast to an unlimited number of guests. It transmits its signal once around the network, where all interested stations can pick it up. In broadcast mode, the guest workstations have no ability to control the host station; they can only watch it.

If you wish to achieve a true many-to-one connection with multiple guest stations controlling a single host, you will need to purchase separate copies of *NetOp*. The software checks to make sure that every copy of the guest program has a different serial number.

PASSING GRADES

NetOp is also unusual in that it reads not only the palette registers but the color registers, remapping when necessary to preserve the true colors in graphics images. Because *NetOp* writes directly to the hardware, the remapping works correctly only

Suitability to Task

NetOp

Administrative
monitoring and
tracking



Classroom
teaching



Technical
support



on 100-percent-compatible IBM graphics adapters. Remapping did not work very well on the Compaq computers in our test-bed and changed the colors incorrectly. (Changing colors was not an uncommon problem with these programs; *NetOp* did display all 16 colors and maintain visual details, which accounts for its passing grades on our graphics tests.) Danware is planning a BIOS option for future releases. Currently, if you have contrast problems, you can turn on the Advanced Graphics option to display the screen in black and white.

The product defaults to nonsynchronous mode, so its slower performance on our benchmark tests was a little unexpected, although it generated very little throughput on our Byte Analysis throughput test. *NetOp* was one of the few packages to pass all our pass/fail tests. It supports VGA-to-EGA graphics mode translation and handles *Microsoft Windows 3.0* very well. It is not a *Windows* application, but it is one of the few packages on the market that can control a host computer running *Windows*. At this time, it can achieve control only through the keyboard in Enhanced mode, but Danware plans to add mouse support. By turning on *NetOp*'s Advanced Graphics option, the guest can view the host running *Windows* in black and white, an operation that drastically speeds up response time.

Technical support for users is excellent, despite the fact that the software is produced in Denmark. International Inter-group offers free, knowledgeable technical support at a toll number weekdays from 8:30 to 5:00 E.S.T. And if a question is beyond the scope of the local distributor, the distributor will contact the developers in Denmark.

NetOp is a powerful package with many capabilities lacking in other packages of its kind. Despite compatibility problems with IPX, it makes a good choice, particularly in training situations.

NETremote Plus

by M. David Stone

NETremote Plus is actually two programs in one package. The first is Brightwork Development's *NETremote Plus* itself, available in either a NetBIOS or Novell IPX version for remote operations over a LAN. The second is an OEM version of

LAN REMOTE CONTROL

Co/Session, a modem-based remote program from Triton Technologies. Even if you don't need both of these capabilities, the price is almost a bargain, \$350 for each file server on a network with one dial-in computer.

The benefit of putting modem- and LAN-based remote features in separate programs is that you wind up with two simple programs instead of a single complex one. Combining these functions can be a problem in offices where few or no users need the modem-based capability. In this review, we will look only at the LAN-based features. (For a review of *Co/Session*, see "The Next Best Thing to Being There," *PC Magazine*, June 12, 1990. We also look at it in the sidebar "Modem-Based Remote Control: The Serial Alternative.")

NETremote Plus is designed primarily for administration and support. Virtually all control rests with the guest module, called *NRCall*. The host, called *NRListen*, has no menus and no control beyond DOS-level command-line options. The host cannot reject a connection after it receives an



FACT FILE

NETremote Plus, Version 4.10

Brightwork Development Inc., 766 Shrewsbury Ave., Jerral Center West, Tinton Falls, NJ 07724; 800-552-9876, 908-530-0440. List Price: \$350

per server. **Requires:** For host: 18K RAM. For guest: 68K RAM TSR or 128K RAM; DOS 3.0 or later; network operating system using IPX 2.10 or later or NetBIOS services. **In Short:** *NetRemote Plus* focuses tightly on administrative and support applications, giving the guest almost total control of the connection and providing a wealth of diagnostic tools. Although limited to one-to-one and daisy-chain connections, the program provides a close equivalent to a one-to-many connection. The package also includes Triton Technologies' *Co/Session*, a modem-based remote program.

CIRCLE 606 ON READER SERVICE CARD



audio notification. And because of the lack of menus, the host has no easy way to restrict the guest at that point. As the module names imply, the host cannot even initiate a call.

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V O I A D O B E N X
D M J L I V O D T V
R A H O E A U X R N
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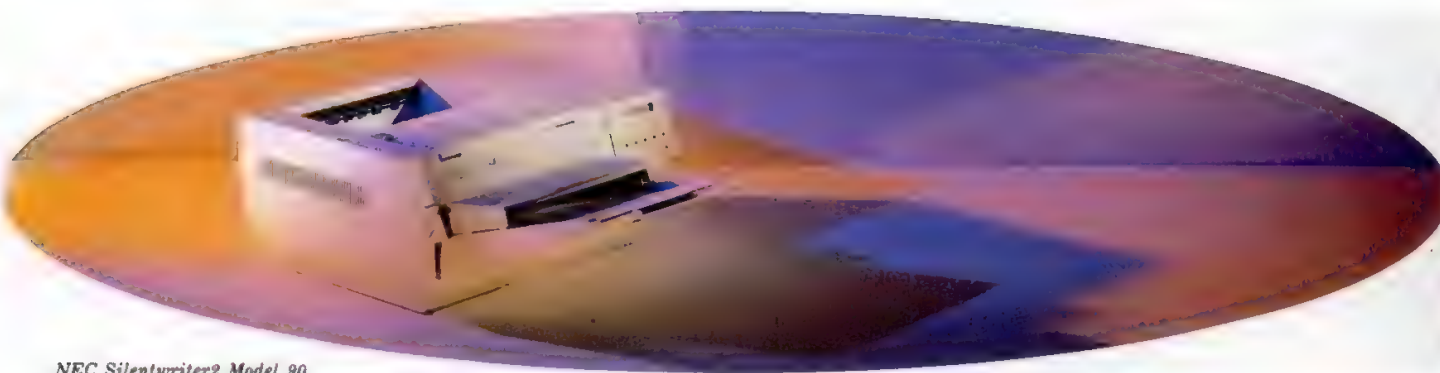
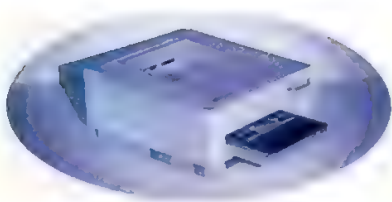
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November 13, 1989
SilentWriter2 Model 90

CIRCLE 375 ON READER SERVICE CARD

CONNECTIVITY LAN REMOTE CONTROL

AN IMPOSING GUEST

The guest, however, has an on-line menu with point-and-shoot options for disabling the host keyboard, rebooting the host, and ending the connection. In addition, the guest has a wealth of diagnostic tools available, with options to view the server, network, or host configuration, to see a map of the programs currently loaded in the host's memory, to get LAN-adapter or IPX statistics, and more.

Strictly speaking, *NETremote Plus* allows only one-to-one and daisy-chain connections, but the program also offers the functional equivalent of a one-to-many connection. Each time the guest ends a connection, *NETremote Plus* shows a list of all users logged on and highlights those who are running the host module. To view another user, you need only highlight the appropriate user name and tap Enter twice.

Installing and setting up *NETremote Plus* is reasonably straightforward. The installation batch file asks which directory to put the files in and whether to install *NETremote Plus*, *CoSession*, or both. A mild copy-protection feature checks the network for other copies of *NETremote Plus* with the same serial number. A full installation, including the *CoSession* files, takes about 900K.

Using *NETremote Plus* is even easier than installing it. The host side simply loads the NRListen module. The guest side loads NRCall, then picks a system from the list of users the program displays. The program makes the connection and displays a menu offering choices for running diagnostics, viewing the configuration, or controlling the PC.

On our benchmark tests, *NETremote Plus* did not deliver record-breaking speeds. It made up for this by sending screen changes, like other programs that default to synchronous mode, thus giving the guest system a truer, more current representation of host activity.

On the pass/fail tests, it handled VGA graphics without problems but had trouble converting between VGA and EGA. Brightwork says the problem shows up on only some EGA cards, like the original IBM EGA adapters, and even then only with a small percentage of software. *NETremote Plus* succeeded on our bridge tests.

The manufacturer does not claim that the program handles *Microsoft Windows* 3.0, although it says an upcoming version will. Brightwork also says that Version 4.11, which was released too late for this

review, can load into expanded or extended memory, cutting conventional memory needs to about 7K on the host and the guest. In our tests of Version 4.10, the host module uses about 18K of RAM; the guest module, 6.8K.

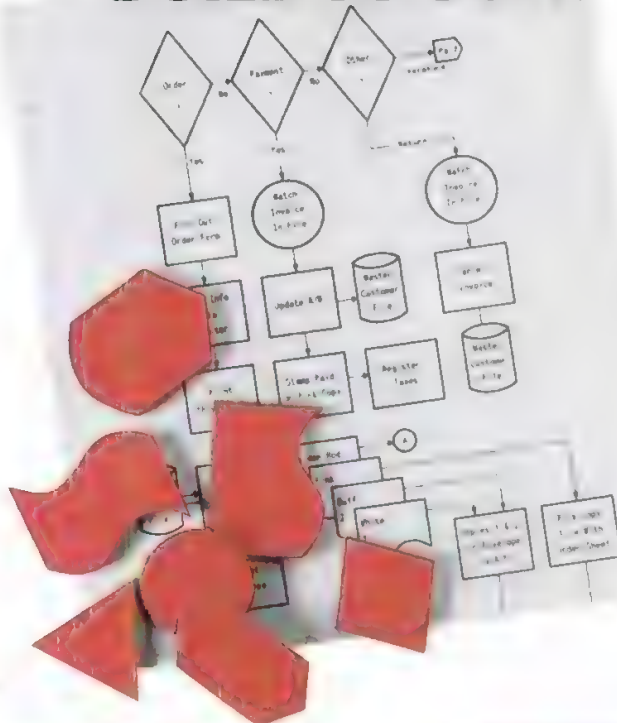
Brightwork offers free technical support on weekdays from 8:00 to 7:00 E.S.T. at a toll-free number. It also provides sup-

Suitability to Task

NETremote Plus

Administrative monitoring and tracking	☐	☐	☐	☐
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(Image Corp.) Perceive Personal brings PC users advanced, full page OCR. Scan all or part of a page and Perceive Personal automatically merges or appends output text into a continuous output file. **GR2193/5 \$185.** Perceive for 286 & 386 PC/AT compatibles converts a printed page into word processor compatible text in a minute or less—and it's Windows compatible. **GR2193/5 \$435**



★ Presentation Task Force

(New Vision Technologies) Clip art for those who mean business. Presentation Task Force contains 1,100 vector graphics in the popular CGM format, making it compatible with most PC charting, drawing and word processing programs. The collection has been designed for business, health care and military professionals, and is suitable for all types of color and black and white printers. **GR0823/5 \$134.**



★ QEMM 386 5.1

(Quarterdeck Office Systems) Say good-bye to memory expansion problems when you install Quarterdeck Expanded Memory Manager 386 (QEMM 386). This award winning utility cleverly manages both extended and expanded memory in 80386, 80386SX and i486 computers, freeing up to an additional 226K for your programs to run in. QEMM 5.1 now supports Microsoft Windows 3.0! **EX1103/5 \$61.**



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(Symantec) Just Write—it's as simple as that. This fast and easy word processing program for Windows is ideal for all of your business needs. Combine text and graphics for impressive documents in a snap—even mail merge with most popular database formats to create personalized letters. Supports Windows Dynamic Data Exchange and includes automatic file conversions. **WP1573/5 \$129.**



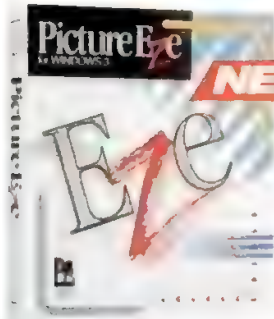
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(Corel Systems) CorelDRAW! is the award winning PC graphics software that gives you incredible type control and superb drawing power in a value-packed program. Now, CorelDRAW! 2.0 comes with more drawing power and over 150 fonts; over 3500 clipart images and symbols; 31 import/export filters; an autotrace utility, a font conversion program and Mosaic, a visual file manager. **GR0543/5 \$379.**



★ PictureEze

(Application Techniques, Inc.) PictureEze, a graphics file converter for Windows 3.0, supports a variety of different input file formats. Converts images into the correct file format your application requires. Features flexible output file types, superior image modification, flexible color enhancements, quick results and repeat operations to convert a series of images. **GR2134 \$99.**



★ Intermission

(Icom Simulations) This window screen saver and password protection system saves your monitor by automatically displaying one of thirty animated screen saver modules. Protects your confidential work with password protection so only you can return to your screen—and even protects your system from a reboot. Includes Curtain Call—the windows wallpaper changer. **GR1854 \$35.**



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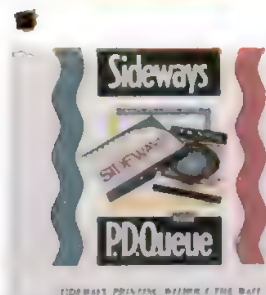


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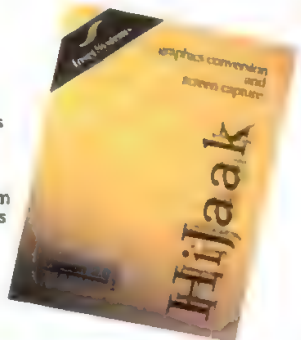


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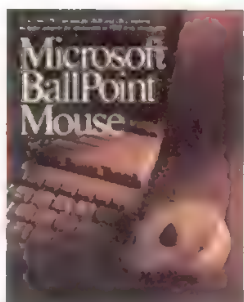
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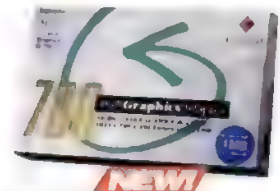
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CONNECTIVITY

LAN REMOTE CONTROL

port through a bulletin-board service.

NETremote Plus's configuration limitations make it a questionable choice for classroom and co-computing situations, but the program should fit nicely if you need support and administrative functions. And ColSession adds a neat little bonus for those who can make use of it.

The Network Eye

by Michael Cohn

You might call Artisoft's *The Network Eye* the LAN remote-control package that says, "Here's looking at you, kid." The program has an option to display an icon resembling an eye in one corner of a monitored host station's screen. Although *The Network Eye* controls only character-mode applications, it supplies an easy-to-use interface and the ability to display up to 32 windows on-screen: the guest screen (or master, as Artisoft calls it) and 31 hosts. You can pop up host windows in front of one another, or view one line from each host display when 32 windows are on-screen simultaneously.

At a cost of \$199 per network, the package is a genuine bargain, particularly in a user-training environment where a large number of machines must be connected. The program runs over NetBIOS-compatible networks, including Artisoft's own LANtastic. Of course, it also runs over Novell's NetWare.

You can switch control among as many as 32 machines, simply by pressing the Plus and Minus keys. Or *The Network Eye* can rotate control among the various windows automatically, pausing for a few seconds at each.

You can resize windows with the cursor keys, use a clipboard window to cut and paste text between two windows, and zoom any window to full-screen size by hitting a key combination.

The 32 stations can connect in true many-to-one, one-to-many, or many-to-many combinations; you can have an unlimited number of machines linked by *The Network Eye*. We could not send a printer dump to a host station by hitting Shift-Print Screen, but you can remotely control peripherals by using local applications on the hosts (workstations, to Artisoft) or through network resources.

BRIDGE WORK

Although Artisoft does not claim that *The Network Eye* works across wide area networks, we found it could display a *WordPerfect* macro on the guest's screen (slowly), even though the macro ran on a host across a bridge. When both machines were on the same LAN, the macro displayed on the guest screen much more quickly. *The Network Eye* sends the entire content of the video buffer across the cable at timed intervals. This puts more frames on the network than packages that send only screen changes. The program also lets you daisy-chain stations, allowing a PC to function simultaneously as both host and guest, producing a window-within-a-window effect on another guest's screen.

At present, *The Network Eye*'s major limitation is that it works only with character-mode programs. (The program has not been updated since we last reviewed this category of software, almost two years ago.) The program does not allow you to view or control a host running *Microsoft Windows 3.0* in any mode. It could not display our graphics image. Artisoft plans to release a version that will work with graphics programs this summer, and a *Windows*-compatible version later.

Installing *The Network Eye* takes only a few minutes once you decide on the setup and master the concepts in the short but useful manual. On the host side, you can specify whether to display the eye icon, how many guests to allow, and what passwords they must use. You can set passwords restricting a guest to monitoring the host or allowing the guest to control it as

PC FACT FILE



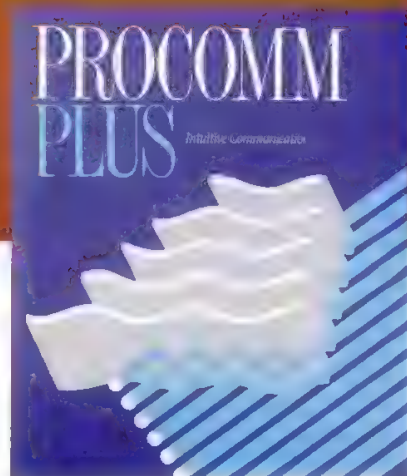
The Network Eye, Version 1.23

Artisoft Inc., 575 E. River Rd., Tucson, AZ 85704; 602-293-6363.
List Price: \$199 per LAN. Requires: For host: Depending on video adapter, 1K RAM to 6K RAM. For guest: 30K RAM; DOS 3.1 or later; network operating system using NetBIOS-compatible services. In Short: *The Network Eye* provides an easy-to-use, cost-effective way to monitor or control up to 32 machines (including the local one) on-screen, or be monitored by as many guests. Ideal for training situations, the program limits its remote control to character-mode applications only.



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well. By leaving out these parameters at the command line, you can allow any guest machine to connect. The installation options on the guest side are more limited. A guest can continue to monitor, or take a quick look at a host screen and return to DOS without staying resident. When resident, the program requires 30K of RAM on the guest side and 1K to 6K on the host side.

With one host and one guest connected,

The Network Eye, despite providing non-synchronous operation, produced some of the slower results we saw on our benchmark tests.

MONITORING ACROSS NETBIOS

After you make sure each station is running NetBIOS and you type in the appropriate commands, pressing the Alt key at

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The Network Eye

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CIRCLE 228 ON READER SERVICE CARD

the guest side brings up the guest and clipboard windows; using the latter, you can patch a piece of one host's screen to another host's window. Hitting the Ins key lets you specify which host stations to monitor, and calls up windows for each. A special configuration program allows you to change hotkeys, but even so, we had trouble invoking *SideKick* since the resident portion installed at the host end didn't see *The Network Eye* passing it keystrokes through the hardware interrupts. *SideKick*, like many memory-resident programs, creates its own keyboard interrupt. But once we popped up *SideKick* by pressing Ctrl-Alt at the host end, the guest side had perfect control.

Artisoft provides free technical support at a toll number. *The Network Eye* offers a good, economical choice when you need to monitor a large group of machines on-screen simultaneously, or when these machines need to monitor you. For a training situation involving character-based software, *The Network Eye* provides a workable, attractive, and easy-to-use environment.

pcAnywhere IV/LAN

by M. David Stone

Dynamic Microprocessor Associates (DMA) has produced a Swiss Army knife of a program by taking a decidedly inclusive approach to *pcAnywhere IV/LAN*, Version 4.03a, priced at \$495 for a two-station license, plus \$25 for each additional workstation. You might best describe the software as a multipurpose communications program with capabilities for remote control over the LAN. It's a very useful product if many of your network users need modem-based remote access to the LAN.

Other blades on the knife include a terminal and host for modem-based remote



When you look at windows, it's not always clear what's behind them.

PC-mainframe software and a Windows interface is an ideal combination. After all, by making programs look similar, a graphical user interface makes them easier to learn and use.

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operations, the equivalent of a standard communications program with Xmodem file transfer and DEC VT220 terminal emulation, and support for communications at up to 115,200 bits per second over a direct cable connection.

The program's modem gateway lets *pcAnywhere IV/LAN* stations use a modem attached to any station running the gateway module. The gateway operates well in the background, using just 27K RAM; you

CONNECTIVITY LAN REMOTE CONTROL

do not have to dedicate a system to the task.

MODEM CONNECTION OPTIONS

DMA limits the connection options to one-to-one and daisy-chain links, showing its focus on modem-based communications. DMA claims a one-guest-to-many-host capability: A guest can establish connec-

tions to several hosts, signing on to each of them with a password, and reconnect to each later without a password. But changing hosts takes a minimum of five key-strokes to accomplish, far too clumsy to qualify as a true one-to-many connection. The program also lacks many-to-one functionality.

Multipurpose design is both *pcAnywhere IV/LAN*'s greatest strength and greatest weakness. If, for example, you need modem-based remote access for outside sales staff along with LAN-based remote features, you may find the combination appealing. You need to learn only one program, one menu structure, and one model of remote computing.

If most of your staff does not need modem-based features, the additional capability serves only to make the package harder to set up and learn. The cascading menus may be visually appealing, but in the attempt to cover all contingencies, *pcAnywhere IV/LAN* provides too many options and too much room for confusion, despite the on-line help.

The program's installation module copies about 900K in files to your network. *pcAnywhere IV/LAN* comes set up for the modem-based remote capability and wakes up with its host mode configured for serial communications over COM1 with a Hayes modem.

To use the software on a local area net-

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PC FACT FILE

pcAnywhere IV/LAN, Version 4.03a
Dynamic Microprocessor Associates Inc., 1776 E. Jericho Turnpike, Huntington, NY 11743; 516-462-0440 List Price: Two users, \$495; each additional user, \$25. **Requires:** For host: 22K RAM; with menus, chat mode, and graphics translation, 62K RAM. For guest: 320K RAM, DOS 3.1 or later; network operating system using IPX 2.0 or later or NetBIOS services. **In Short:** *pcAnywhere IV/LAN* provides a single solution for those who need both LAN-based and modem-based remote capabilities. It handles VGA and EGA graphics and translates between them. It also supports file transfers, terminal emulation, Windows in Real mode, and serial-based direct connections between PCs. But it emphasizes modem-based remote computing over LAN-based methods, limits connections to one-to-one and daisy-chain links, and implements one-to-many linking in a somewhat cumbersome way.

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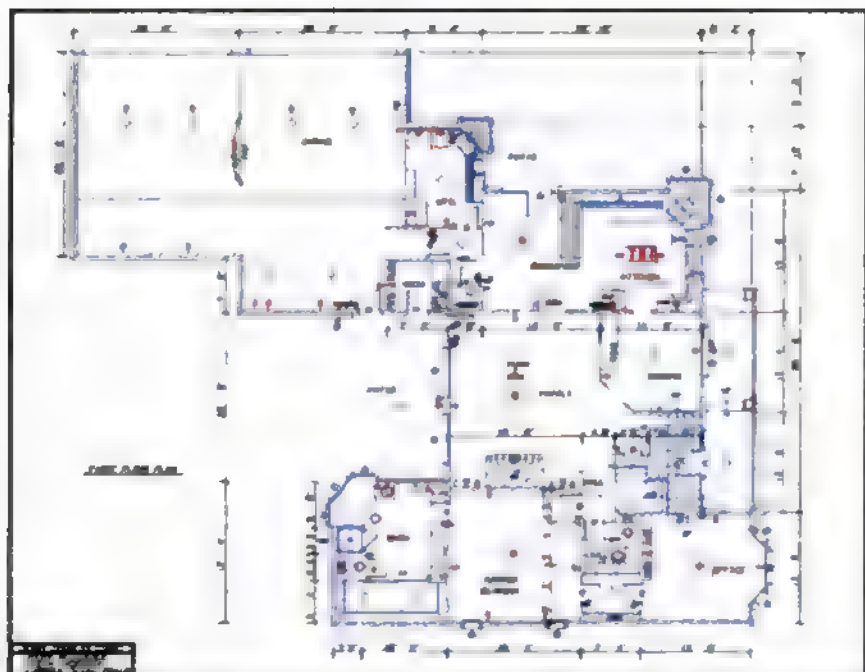


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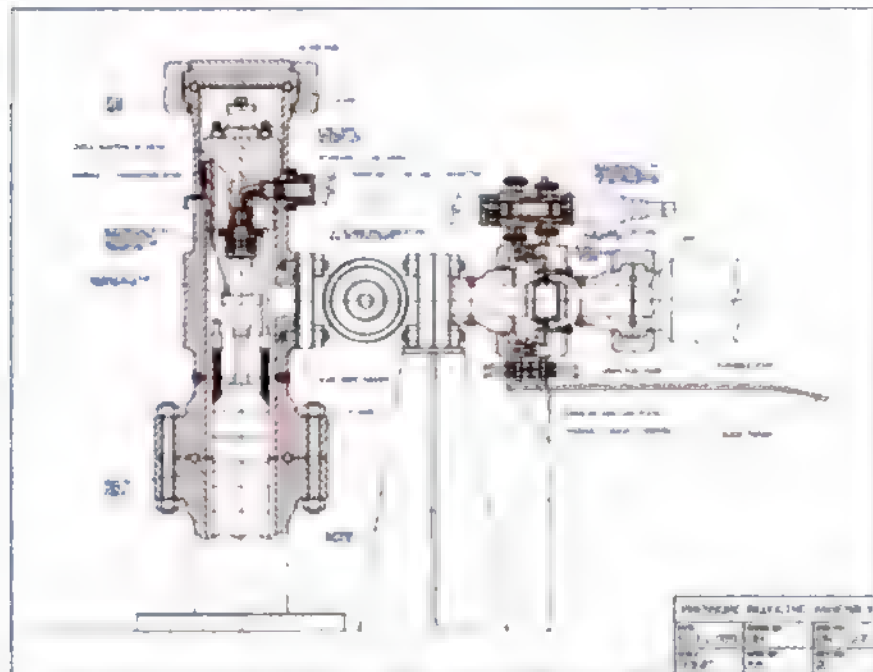
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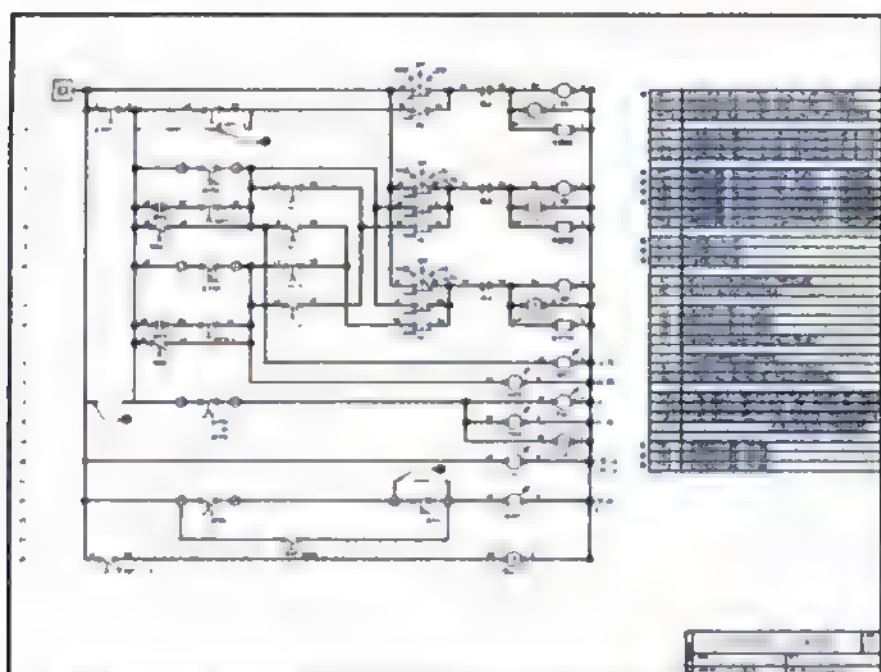
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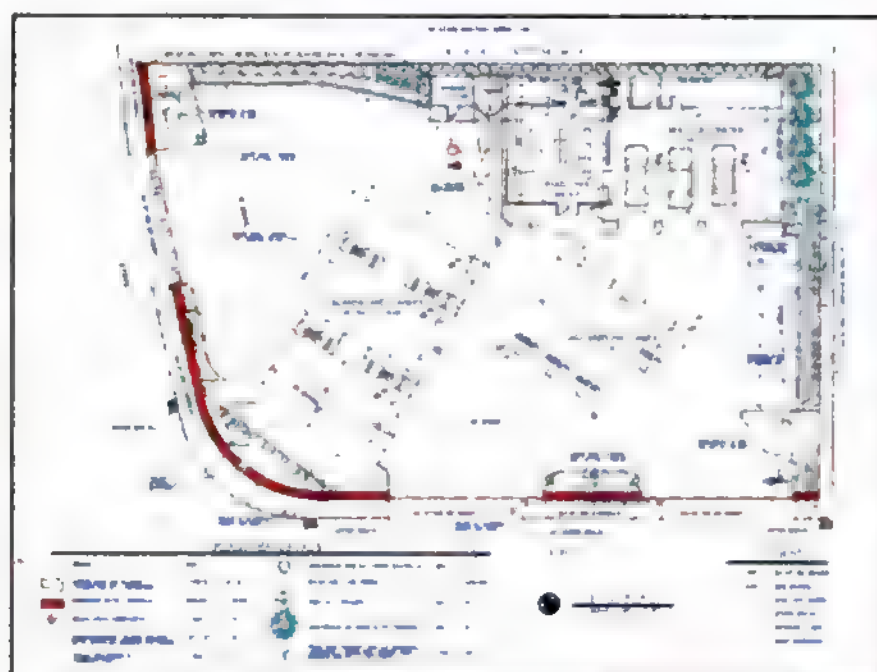
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Suitability to Task

pcAnywhere IV/LAN

Administrative monitoring and tracking	☐	☐	☐	☐
Classroom teaching	☒	☐	☐	☐
Technical support	☒	☒	☐	☐

work, you must first reconfigure the host and guest (which DMA calls the Remote) either for NetBIOS or for *NetWare's* IPX. The program visually notifies the host when the guest makes a connection.

Only the host side runs as a TSR; the full-size version needs about 62K. The package supplies a 22K version, but it has only network support, sacrificing host menus, chat mode, and graphics translation.

BUILDING USER LISTS

The way the program creates lists of users also reflects its modem-based origins. Other programs, such as *NETremote Plus*, automatically generate a list of other stations available on the network. *pcAnywhere IV/LAN* has you enter the list yourself. If you use the standard installation, you need to input a separate list for each user. An advanced installation option lets you make global lists, but the option is less than immediately obvious.

On our tests, *pcAnywhere IV/LAN*, which defaults to synchronous mode, generally operated more slowly than did its nonsynchronous competitors. Of course, it also sent more intermediate screens to the guest. On the pass/fail tests, it was one of the few programs to pass every test, even translating between VGA and EGA graphics. It also handled *Microsoft Windows 3.0* keyboard operations in Real mode (we could view the host in Enhanced mode) and operated over our bridge.

DMA offers free technical support at a toll number weekdays from 10:30 to 5:00 E.S.T., and also operates a technical-support bulletin board. All told, *pcAnywhere IV/LAN* provides inarguable proof that more can be less. If incoming or outgoing modem-based remote communications capability is important to most of your network users, you may find *pcAnywhere IV/LAN* worth the effort of learning. But if you primarily need remote operations over the LAN, you will be better off with a more narrowly focused program.

CONNECTIVITY

LAN REMOTE CONTROL

Remotely Possible

by Wendy Dugas Pérez

Avalan Technology's *Remotely Possible* was the first LAN remote-control package to offer full support for *Microsoft Windows 3.0*, as well as a mouse. The product al-

lows unlimited servers, with prices from \$299 for 8 users all the way up to \$2,299 for 1,024 users.

One of the first things you will notice about *Remotely Possible* is the ease of set-up; you just copy the files to a directory and execute the TSRs. The program works over IPX networks and a new version, which was released too late for this review, adds support for *LAN Manager*, Artisoft's *LANtastic*, IBM's *PC LAN*, 3Com's

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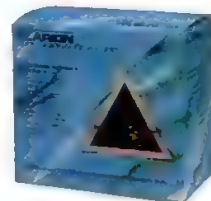
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3+Open, and Banyan's VINES.

Remotely Possible supports expanded-memory managers, so you can load its TSRs into expanded memory and save the 39K required by the guest TSR (or Viewer, as the package calls it) and the 17K for the host. Loading the menus for the host requires an additional 27K, but you can also use expanded memory there. (The guest needs no extra memory for its menus.) You can remove the TSRs without rebooting by executing a simple command-line option. If you want remote keyboard and mouse control when running *Windows*, you need to install extra drivers within the SYSTEM.INI file in the *Windows* directory. The mouse also works well with other DOS applications.

The package's simple menus make it easy to move through the options. The system offers several thoughtful features, including the ability to redirect printing to the guest system, and to switch to DOS and run local applications while remotely controlling the host. You also get optional off-LAN modem capabilities; the documentation provides detailed instructions for using *Remotely Possible* with *Microsoft's Carbon Copy Plus*.

CONNECTIVITY LAN REMOTE CONTROL



FACT FILE

Remotely Possible, Version 2.0c

Avalan Technology Inc.,
747 Washington St.,
Holliston, MA 01746;
508-429-6482. List

Price: 8 users, \$299; 32 users, \$399; 64 users, \$599; 128 users, \$799; 256 users, \$999; 512 users, \$1,299; 1,024 users, \$2,299; unlimited servers at each location.

Requires: For host: without menus, 17K; with menus, 44K RAM. For guest: 39K RAM; DOS 2.1 or later; *NetWare* IPX, Version 2.0a or later; if used with *Microsoft Windows* 3.0, the latest IPX driver from Novell. **In Short:** *Remotely Possible's* most important feature is its full support for *Microsoft Windows* 3.0, including mouse functions. The program lacks true one-to-many or many-to-one connections, and is not the choice for those who need to administer and track network users and resources. But it does offer daisy-chaining, ease of use, and good documentation. The company's generous upgrade policies and 30-day money-back guarantee are also pluses.

CIRCLE 608 ON READER SERVICE CARD

When the guest connects, the Scroll Lock LED blinks on the host machine. The host machine can disable this visual notification, but the guest station can disable the notification only if the user knows the right password.

The user manual says the package will support bridges, routers, and brouters, but the product could not operate over our test bridge connecting a Token-Ring and Ethernet network. The company told us this may be due to Bridge Gen's inability to route certain diagnostic packets across the bridge. Interestingly, we could connect a guest to a host over a bridge between two Token-Ring networks.

COMPENSATORY FEATURES

Remotely Possible lacks some features that would increase its usefulness. The program does not support translation of VGA graphics to an EGA guest. Additionally, a guest cannot simultaneously connect to multiple hosts; you must disconnect from one host and then connect to another. Fortunately, since you do not have to exit the package, this procedure does not take too long. *Remotely Possible* could still be practical in a training situation.

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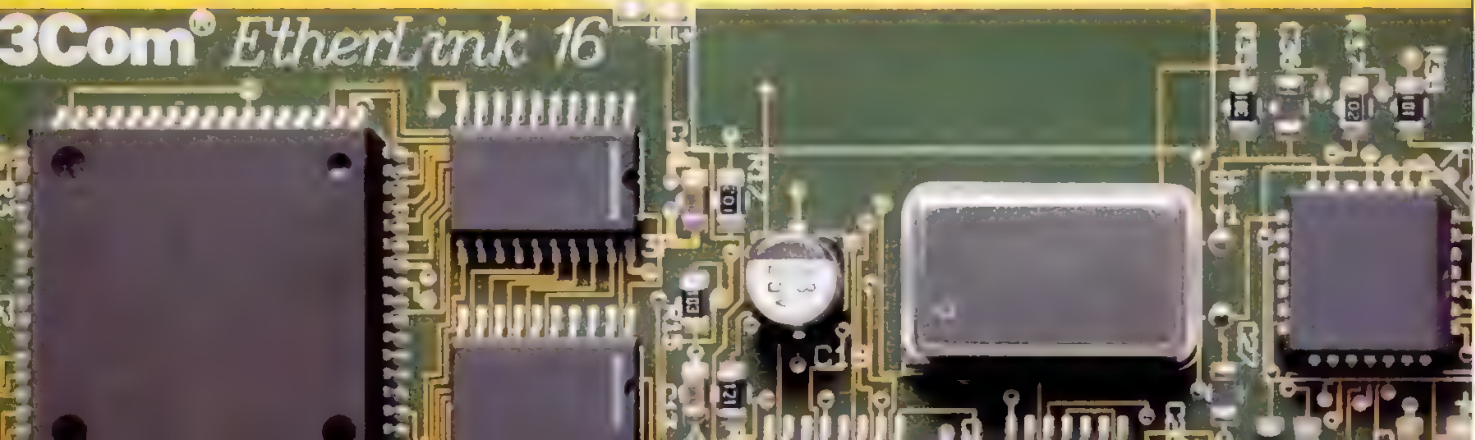
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You cannot have multiple guests connecting to one host. The program does support daisy-chains, allowing you to have a guest also serve as a host and then let another guest control it. This would allow multiple students to view, for instance, a host teacher's screen.

GOOD PERFORMANCE

Remotely Possible can operate in synchronous or nonsynchronous mode, but it defaults to the latter option. It performed respectably on our benchmark tests, and provided some of the best performance on our Byte Analysis throughput test.

One way to enhance the package's performance is to choose the Refresh Screen

Suitability to Task

Remotely Possible

Administrative monitoring and tracking



Classroom teaching



Technical support



**Avalan Technology's
Remotely Possible was
the first LAN remote-
control package to
offer full support for
Microsoft Windows 3.0,
as well as a mouse.**

Delay option on the guest menu so that it does not force a screen refresh when it makes video BIOS calls that cause screen changes. Instead, it will refresh according to the update frequency chosen by the guest, or when keyboard or mouse input produces its own changes.

The documentation, while good, could use a more extensive index. Avalan offers competitive service and support policies and allows registered users to upgrade for free within one year of purchase. The company provides a 30-day money-back guarantee and free technical support on weekdays from 8:30 to 6:00 E.S.T. at a toll-free number.

Remotely Possible has ease of use, good technical support and upgrade policies, and the ability to control a mouse on the host. If *Windows* and mouse support are a must, then this is the package that you have been looking for. However, if you need tools to help you administer your network and support a wide variety of users, or if you need to broadcast to a large number of users at once, you may want to look elsewhere. ■

Gary Berline is a consultant in New York City. Sheryl Canter is a software developer. Michael Cohn is a staff editor at PC Magazine. Carol Ellison is a contributor to PC Magazine, based in New York City. Wendy Dugas Pérez is a project leader at PC Magazine Labs. M. David Stone is a contributing editor of PC Magazine.

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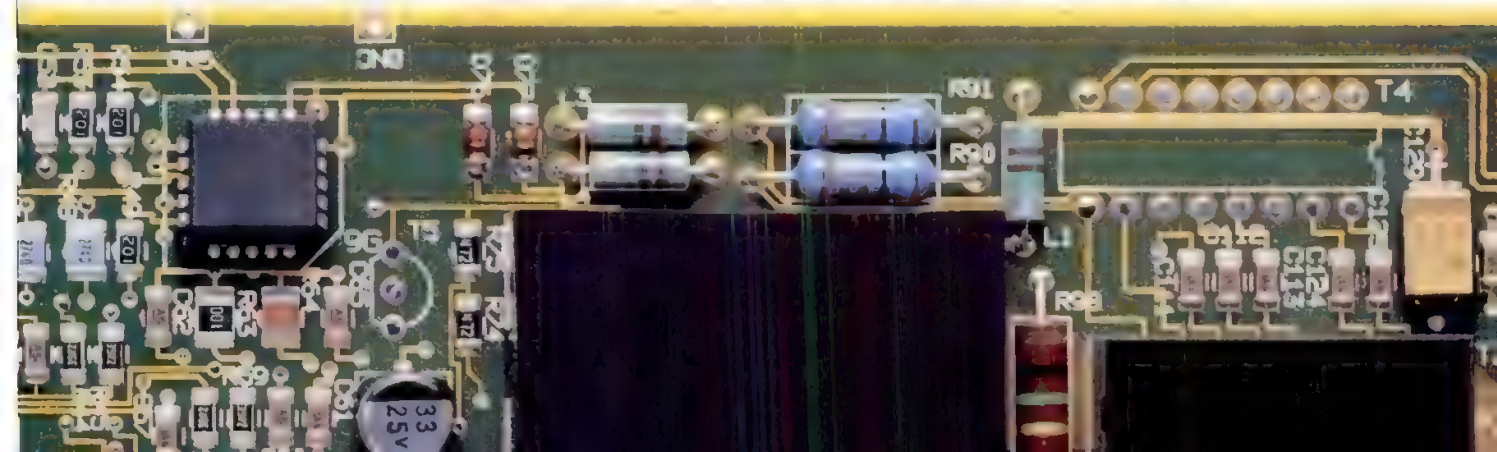
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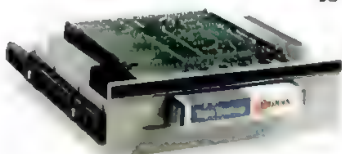


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PC WEEK

August 14, 1989

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CIRCLE 473 ON READER SERVICE CARD



We've sorted through 35 *WordPerfect* books to find the best ones for your personal or corporate training needs. Whether you're a novice, a power user, a macro collector, or a desktop publisher, there's a book for you. Pass the word.

by Janet Rubenking

WordPerfect is the undisputed leader in word processing. With more than six million copies sold since WordPerfect Corp. introduced the first version for DOS in 1982, chances are that there are at least that many people out there with a question or two about the package's features. The enormous program, which comes on 11 360K floppy disks, has created a market for dozens of training books designed to help users get the most out of it. It's not that the software has a daunting learning curve; it's actually quite easy to

learn. The problem is that the sheer number of features simply require more explanation than the documentation alone can provide.

Twelve years after *WordPerfect's* debut on minicomputers, it continues to evolve, with major upgrades appearing almost every few months. The most recent upgrade to *WordPerfect's* text version, Version 5.1 (dating from November 1989), delivered new desktop publishing capabilities that made the distinction between word processing and desktop publishing less defined. A clip-art library,

links to disk-based graphics, and easier control over page layout supplement *WordPerfect's* already powerful publishing features, which include 250 fonts and styles, kerning and leading control, gray-scale shading, graphics boxes and borders, and the ability to import scanned images or graphics from spreadsheet and drawing packages.

WordPerfect's mail-merge is now highly programmable with user-definable fields and records, its macro language is

expansive, and its column and mathematics features bring basic spreadsheet functions to word processing. These changes reflect the high level of functionality that all users, not just the experts, now expect. And in order to explain these new functions, the *WordPerfect* documentation has doubled in size from 554 pages for Version 5.0 to 1,023 pages for Version 5.1.

A FEW WORDS ABOUT TRAINING

As classroom instruction is progressively being viewed as only one of many training methods, books are gaining greater recog-



EDITORS' CHOICE

- *WordPerfect 5.1 QuickStart* (quick-start)
- *WordPerfect 5.1 Instant Reference* (pocket guides)
- *WordPerfect 5.1 Made Easy* (tutorials)
- *WordPerfect 5.1 Tips, Tricks, and Traps* (tips and tricks)
- *WordPerfect 5.1: The Complete Reference* (reference)
- *WordPerfect 5.1 Macros and Templates* (macros)
- *WordPerfect Desktop Publishing in Style* (desktop publishing)

If you want to learn everything there is to know about *WordPerfect*, we recommend Karen Acerson's *WordPerfect 5.1: The Complete Reference* and Gordon McComb's *WordPerfect 5.1 Macros and Templates*. Both Acerson and McComb are authorities on *WordPerfect* and write with accuracy, clarity, and style. Both books are complete instructional guides for advanced graphics, macros, and merges, and great sources of productivity advice that will challenge even the experts.

An excellent replacement for the *WordPerfect* manual, Acerson's reference examines every tidbit in a simple A-to-Z format, which includes definitions and examples of functions not covered in the other references. (It's even used in preparation for *WordPerfect* certified instructor tests given by WordPerfect Corp.)

McComb's *WordPerfect 5.1 Macros and Templates* does not

teach you the principles of programming, but it does provide the fundamentals to get you thinking like a programmer—introducing terms like flow control, routines, subroutines, and branching. Users can learn a lot about programming by studying the ready-to-run macros that accompany the book. *Macros and Templates* is for the serious *WordPerfect* user looking for a supplement to the manual or wanting to build a customized system.

The best pocket guide is *WordPerfect 5.1 Instant Reference* by Greg Harvey and Kay Yarborough Nelson. This slim volume is an A-to-Z reference with a brief explanation, advice, and key sequences for each function. For \$7.95, it's the most complete quick refresher on *WordPerfect*.

Of the three books that provide a quick working knowledge of *WordPerfect*, the best book is *WordPerfect 5.1 QuickStart* by Kathie-Jo Arnoff. This step-by-step introductory guide to *WordPerfect* takes new users progressively through installation, using the keyboard, editing, and formatting—all the way to practicing with macros and graphics. Arnoff teaches *WordPerfect* terminology, provides keystroke-by-keystroke examples, and includes annotated screen diagrams to get you up and running quickly.

If you've worked through the

lessons in *WordPerfect's* on-screen tutorial and in the *WordPerfect Workbook* that comes with the documentation but still need some more practice, consider a tutorial book. Most of these books are written for new users and are conversational in tone. The best value is Mella Minberg's *WordPerfect 5.1 Made Easy*, a 1,071-page volume that introduces first-time users to *WordPerfect* and includes material to interest those who are already familiar with the program. *WordPerfect 5.1 Workbook and Disk* is notable for being one of two books in this group that includes a floppy disk with demonstration documents you can work along with.

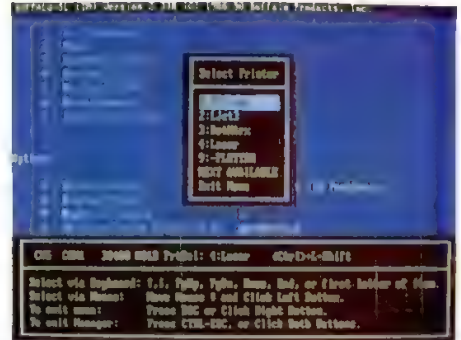
For tips and advice on using *WordPerfect* productively, Que's *WordPerfect 5.1 Tips, Tricks, and Traps* is a good source. And you can't go wrong with any selection from the desktop publishing books. Each author is an expert who knows the subject well and communicates effectively. Daniel Will-Harris's *WordPerfect Desktop Publishing in Style* should be a popular choice for anyone who wants to use *WordPerfect's* desktop publishing features for professional documents. In *Desktop Publishing with WordPerfect 5.0 and 5.1*, desktop publishing and design expert Roger C. Parker takes a more serious look at the elements of good design.

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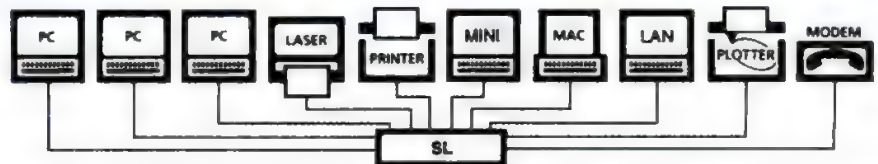
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CIRCLE 328 ON READER SERVICE CARD

TRAINING TOOLS

WORDPERFECT BOOKS

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nition as effective learning tools. Que's *Using WordPerfect 5.1*, Special Edition has sold over 750,000 copies, and Osborne McGraw-Hill's bestsellers, *WordPerfect 5.1: The Complete Reference* and *WordPerfect 5.1 Made Easy* have each sold several hundred thousand copies.

With so many books on *WordPerfect 5.1* out there, making the right choice can be hard. We went through the stacks to find every *WordPerfect 5.1* book currently available and came up with 35 books ranging in price from \$6.95 to \$39.95. Some are good replacements for the *WordPerfect* manual, some can serve as quick references to get a handle on the interface, and others are strictly for power users. To make it easier for you to decide which books will meet your needs, we separated them into eight categories: quick start, pocket guides, tutorials, tips and tricks, complete reference, macro collections, upgrading from Version 5.0 to 5.1, and desktop publishing.

Beginners will gain the most from the quick start and tutorial books, which work through the basic steps. The complete reference guides, such as Karen L. Acerson's *WordPerfect 5.1: The Complete Reference*, cover all aspects of *WordPerfect* and virtually replace the documentation. Power users will find a wealth of information in the tips and tricks, desktop publishing, and macro books, which focus on *WordPerfect*'s powerful mathematics and macro functions, advanced typographic controls, printer controls, and areas inadequately covered in the manual such as automatic cross-referencing, paragraph numbering, and footnoting.

Most of the books are illustrated with visual references to *WordPerfect* functions, and many, like Que's *Using WordPerfect 5.1*, Special Edition, feature extras like pull-out reference cards, charts, and tables of *WordPerfect* commands and special functions. Seven of the tutorial

and macro books come with floppy disks containing lessons and examples.

All of the books have something to offer, but a few stand out from the crowd. A favorite of *PC Magazine*'s contributing editor Edward Mendelson is *Using WordPerfect 5.1*, Special Edition (Que), an encyclopedic volume of essays by 20 specialists who examine the simplest steps all the way to advanced macro programming. (See "Read Only," *PC Magazine*, March 12, 1991, where Mendelson looks at three *WordPerfect* books.)

BEYOND THE BOOKSHELF

Before you turn to any book, there's no reason you can't get started with *WordPerfect*'s own documentation. It includes a reference manual with an alphabetical listing of functions, an on-line tutorial, the *WordPerfect Workbook* that takes you step by step through document creation, and a context-sensitive on-line help system. The manual is comprehensive and clear, yet its alphabetical format limits it to being a reference source rather than a hands-on learning tool. There are also separate toll-free customer support lines for installation, graphics, printers, features, and networks, and another number (toll charge) available for after-hours word processing emergencies.

Though we didn't evaluate training videotapes in this article, several are available from companies like M-USA of Dallas, Texas (214-931-0024), Learnkey of Orem, Utah (800-937-3279), and JAZ of Huntington Beach, California (800-634-8855). On-line training software is available from Individual Software of San Carlos, California (800-331-3313) and audio tape training is available from FlipTrack Learning Systems of Glen Ellyn, Illinois (800-222-3547).

With *WordPerfect for Windows* shipping later this year, book publishers will have plenty of new technology to explain. At least one book, *Mastering WordPerfect for Windows* (Sybex), is expected to be available by July, and more are surely on the way. Like a writer's bookshelf stacked with carefully selected reference works, your personal or corporate library isn't complete without one or more of these *WordPerfect* guides. The following 35 reviews are presented in alphabetical order within each book category. None of these books will make you a better writer, but they'll all help you look good in print.

Quick-Start



The First Book of WordPerfect 5.1
by Kate Barnes

Teach Yourself WordPerfect 5.1
by Rob Krumm

WordPerfect 5.1 QuickStart
by Kathie-Jo Arnoff

Most users' initial exposure to PCs is through word processing programs, but for first-time computer users a package like *WordPerfect* can be intimidating. If you don't know an active window from a drop-down menu or think that installing a printer driver means attaching some gadget to the printer, then you need one of these three quick start books.

Kate Barnes, the author of the *The First Book of WordPerfect 5.1* (Sams, \$16.95), eases new users into the program by covering only the most commonly used functions in clear and concise language. The first few chapters provide an overview of the components you'll be working with—floppy disks, directories, mouse, keyboard—and explain *WordPerfect*'s installation procedure. Barnes gives detailed step-by-step instructions for each procedure and then lists the steps in highlighted text to reinforce learning.

First Book is organized by function, from basic text editing to advanced table creation. Visually, Barnes's book is easy to follow. It is readable and free from the clutter of color-coded cross-referencing, exceptions, notes, diagrams, or commands.

Teach Yourself WordPerfect 5.1 (MIS:Press, \$19.95), written by Rob Krumm, does not contain the substance or scope of *WordPerfect 5.1 QuickStart* (Que,

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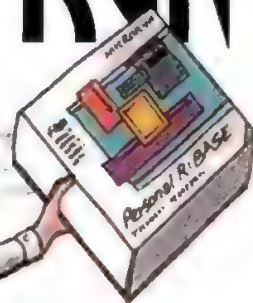
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Full on-line tutorial	✓		✓
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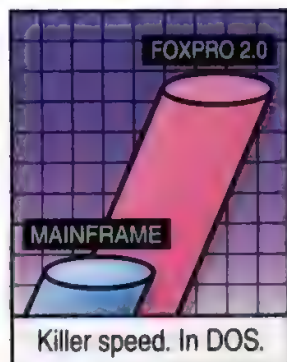
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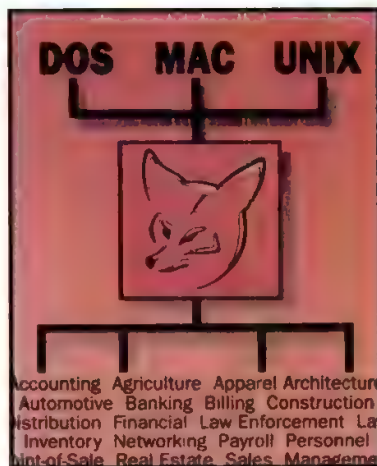
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TRAINING TIPS



■ Creating Graphic Boxes

"When you create a box, you specify the type of box, its contents, the text for the caption, the placement on the page, and the size of the box. To add a gray shade, select Gray Shading (% of black) and type a percentage from 1 to 100. Zero percent shading is white; 100 percent shading is black."—*WordPerfect 5.1 QuickStart*, by Kathie-Jo Arnoff, page 366.

\$19.95). The first 90 pages is an editing assignment in which you are asked to type a simple letter. There are some diagrams of *WordPerfect*'s screens, but they fall short from the ones illustrated in *WordPerfect 5.1 QuickStart*, which has a better overall design.

Teach Yourself WordPerfect 5.1's examples are clear and useful to computer novices who have never had to navigate through a word processing program.

WordPerfect 5.1 QuickStart, written by Kathie-Jo Arnoff for Que, is the best beginner's book, providing more information than a newcomer really needs. This starter guide is organized by functions: editing, using blocks, formatting pages, using columns, creating graphics, and more. It outlines basic word processing and does not stretch into the details of advanced topics.

Each chapter begins with a helpful sidebar that defines key words unfamiliar to new users, such as word wrap, soft return, hard return, and cursor. *QuickStart* does not provide exercises, but it does offer step-by-step instructions.

QuickStart's lessons delve more deeply into the *WordPerfect*'s advanced features than the other books, but they serve more as topical surveys than in-depth explanations. There is a lesson on starting your own macro library, which includes instructions for memo headings, margins, and italics. Other advanced features such as creating form letters, addressing envelopes, printing mailing labels, setting up columns and footnotes, and illustrating a document with graphics, are covered briefly. The point of these books, however, is to provide a quick and easy start to a complex program, and of the three books reviewed here, *WordPerfect 5.1 QuickStart* is the most complete.

TRAINING TOOLS

WORDPERFECT BOOKS

The First Book of WordPerfect 5.1, by Kate Barnes. Sams, Macmillan Computer Publishing, 11711 N. College Ave., Carmel, IN 46032; 800-428-5331, 317-571-3489. List Price: \$16.95. Pages: 274 pp. Copyright: 1990. ISBN: 0-672-27307-1.

CIRCLE 396 ON READER SERVICE CARD

Teach Yourself WordPerfect, by Rob Krumm. MIS:Press, 524 N. Tillamook St., Portland, OR 97227; 800-626-8257, 503-282-5215. List Price: \$19.95. Pages: 272 pp. Copyright: 1990. ISBN: 1-55828-048-0.

CIRCLE 397 ON READER SERVICE CARD

WordPerfect 5.1 QuickStart, by Kathie-Jo Arnoff. Que, Macmillan Computer Publishing, 11711 N. College Ave. Carmel, IN 46032; 800-428-5331, 317-571-3489. List Price: \$19.95. Pages: 427 pp. Copyright: 1990. ISBN: 0-88022-558-0.

CIRCLE 398 ON READER SERVICE CARD

Pocket Guides



Fast Access/WordPerfect 5.1
by Rhyder McClure



WordPerfect 5.1 Instant Reference
by Greg Harvey and
Kay Yarborough Nelson

WordPerfect 5.1: The Pocket Reference
by Mella Minberg

WordPerfect 5.1 Quick Reference
edited by Sandra Blackthorn

You probably won't tuck these pocket guides into your back pocket, but you will reach for one when you need a quick refresher on key sequences for downloading soft fonts or creating a printer defini-

tion for a new printer. The material in the four books reviewed here is organized alphabetically by functions so you can quickly find answers without leafing through pages of verbose instructions.

Fast Access/WordPerfect 5.1 (Brady Computer Books, \$16.95) by Rhyder McClure is a super-convenient A-to-Z reference guide that's hardly pocket-size. The bulk of this 348-page textbook is the reference section of alphabetized functions. Each entry includes a definition, examples for executing the function, a list of related functions, and a brief paragraph containing helpful tips and advice. Unlike the other guides, *Fast Access* includes step-by-step instructions for many *WordPerfect* commands, such as installing Bitstream fonts and using the Text In/Out function to retrieve an ASCII file.

McClure focuses on the most commonly used functions, but skips such basics as installing the package and configuring the printer. Visually, *Fast Access* is strictly business, adding no color-coded cross referencing for you to decipher. You'll find a tear-out gatefold with function keys on one side and the IBM extended keyboard layout on the other.

WordPerfect 5.1 Instant Reference (Sybex, \$7.95) is another A-to-Z pocket guide that is more detailed than some other pocket reference books, and it's the only one with charts and illustrations. It contains tables of all *WordPerfect* functions and cursor keys on the inside book covers and has the most thorough table of contents and index seen in any of the pocket guides.

Although it's the best of the pocket guides the writing style can be confusing and the new-feature update notes are not detailed; some are even incorrect.

All of the command keystrokes are clearly spelled out in bold letters under the subject heading followed by a description that's not stated as simply as possible. The book uses some abbreviations that are not explained and may confuse a novice. *Instant Reference* gives detailed information on using a mouse, pull-down menus, and writing macros, including keystrokes for the macro editor, but it doesn't explain the macro programming language.

Mella Minberg's **WordPerfect 5.1: The Pocket Reference** (Osborne McGraw-Hill, \$6.95) is the most compact, low-cost guide of the 35 books we reviewed. Every function—all the way from Addition to Word Spacing—is highlighted and followed by a list of key sequences that



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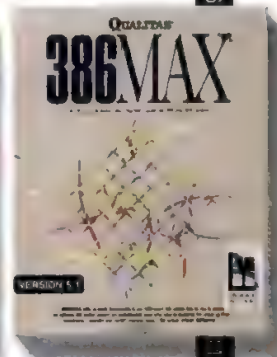
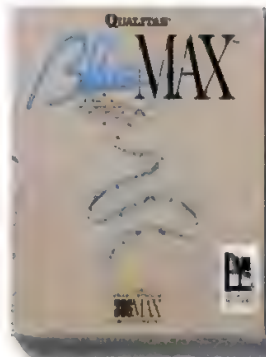
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CIRCLE 258 ON READER SERVICE CARD

TRAINING TIPS

■ Text and Graphics

"WordPerfect will flow the text around the borders of the graphics box if the Wrap Text Around Box option is set to Yes. On the editing screen, it draws the outline of the graphics box as you enter the text of the document. If you change this setting to No, the text will go through the graphic and the box outline will not appear on the editing screen."

—*WordPerfect 5.1 Instant Reference*, by Greg Harvey and Kay Yarborough Nelson, page 81.

activate the command and a brief summary of what you can do with the function. Basically, the only missing information is the instructions for using the macro editor.

The index is easy-to-use, and most entries include cross references for related functions.

WordPerfect 5.1 Quick Reference (Que, \$8.95) is a compilation of the most common WordPerfect commands. It features a comprehensive table of contents, an index, and an attractive design. There is an introduction, hints for using the book most effectively, a list of Version 5.1's new features, and an A-to-Z listing of WordPerfect functions. *Quick Reference* does not provide information on printer selection or program installation, but there is help for WordPerfect customization. This book doesn't use the same subject headings as the WordPerfect manual, and the writing is not concise at times making search time for commands longer.

Fast Access/WordPerfect 5.1, by Rhyder McClure. Brady Computer Books, Simon & Schuster Inc., 15 Columbus Circle, New York, NY 10023; 212-373-8052. List Price: \$16.95. Pages: 348 pp. Copyright: 1990. ISBN: 0-13-307646-6.

CIRCLE 398 ON READER SERVICE CARD

WordPerfect 5.1 Instant Reference, by Greg Harvey and Kay Yarborough Nelson. Sybex Inc., 2021 Challenger Dr., #100, Alameda, CA 94501; 800-227-2346. List Price: \$7.95. Pages: 252 pp. Copyright: 1990. ISBN: 0-89588-674-X.

CIRCLE 400 ON READER SERVICE CARD

WordPerfect 5.1: The Pocket Reference, by Mella Mincberg. Osborne McGraw-Hill, 2600 Tenth St., Berkeley, CA 94710; 800-227-0900. List Price: \$6.95. Pages: 224 pp. Copyright: 1990. ISBN: 0-07-881662-9.

CIRCLE 401 ON READER SERVICE CARD

TRAINING TOOLS

WORDPERFECT BOOKS

WordPerfect 5.1 Quick Reference, edited by Sandra Blackthorn. Que, Macmillan Computer Publishing, 11711 N. College Ave., Carmel, IN 46032; 800-428-5331, 317-571-3489. List Price: \$8.95. Pages: 150 pp. Copyright: 1990. ISBN: 0-88022-576-9.

CIRCLE 402 ON READER SERVICE CARD

Tutorials



The ABC's of WordPerfect 5.1
by Alan R. Neibauer

Illustrated WordPerfect 5.1
by Jordan Gold

Teach Yourself WordPerfect 5.1
by Mary Campbell

Teach Yourself WordPerfect 5.1
by Jeff Woodward

The WordPerfect Book
by Leo J. Scanlon

**WordPerfect 5.0/5.1:
A Self-Teaching Guide**
by Neil Salkind



**WordPerfect 5.1
Made Easy**
by Mella Mincberg

WordPerfect 5.1 Step-by-Step
by Judd Robbins

WordPerfect 5.1 Workbook and Disk
by Marianne B. Fox and Lawrence C. Metzelaar

WordPerfect PC Tutor
by Marianne B. Fox, Lawrence C. Metzelaar, and Susan Hafer

There is a fine line separating these ten tutorials from the books reviewed in the Quick-Start section. In general, the books we've categorized as tutorials are more inclusive and are directed at users who want to obtain a thorough knowledge of WordPerfect right from the start.

Alan R. Neibauer's *ABC's of WordPerfect 5.1* (Sybex, \$19.95) is a primer for users new to WordPerfect or even to PCs. The book is a series of short lessons arranged in a natural progression from simple concepts to advanced features. All of the instructions are simple and the screen illustrations are plentiful. The macro editor is not covered, but there are about a dozen sample macros. *The ABC's of WordPerfect 5.1* introduces the basics

to beginners, but it doesn't stand out from the competition.

Structured as an A-to-Z reference guide, *Illustrated WordPerfect 5.1* (Wordware Publishing, \$23.95) by Jordon Gold is both a tutorial book and a reference guide for absolute beginners. It begins with Word-

Perfect installation instructions, an overview of document creation, and a quick rundown on cursor key movements.

The lessons are based on a sequence of learning modules with sample text highlighted in bold for you to type onto the screen, but the layout is awkward.

While you'll find more details about macros and merges in *Illustrated WordPerfect* than in some of the other tutorials, you will not learn all of the programming commands. Furthermore, the commands listed are not fully explained, and new users are cautioned about using the macro editor—advice that may hold them back unnecessarily—and the macros tutorial includes only one example.

Teach Yourself WordPerfect 5.1 (Osborne McGraw-Hill, \$19.95) by Mary Campbell is a 1,040-page tutorial packed with lessons containing detailed steps, but some WordPerfect essentials are left out.

The book skimps on cursor and function key tables and only skims the surface of many basic functions. Instructions for changing the page numbering style in automatic pagination, a simple and necessary function covered in other tutorial books, is not included. You'll learn how to create page numbers with headers, but the book fails to mention that you can place a ^B anywhere in a document to insert the current page number.

Teach Yourself WordPerfect 5.1

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(Sybex, \$21.95) by Jeff Woodward shares the same title and editorial approach with Campbell's book. There is not much text on a page—just short explanations of functions, followed by keystroke instructions—but the book is packed with colorful illustrations, which gives it a visual approach to learning.

Woodward includes handy reference charts for cursor movements, codes, commands, and keystrokes and covers the basics of hardware and installation. The book is not handy for learning *WordPerfect* terminology, however. It doesn't even explain the term *word wrap*, a basic concept that a new user may not know.

The book does not cover the equation editor feature, but it does give simple instructions for adding graphics to your text. The section on macros is extremely brief with no instructions at all for macro commands, the editor, or the programming language.

The WordPerfect Book (Windcrest Books, \$17.95) by Leo Scanlon covers four versions of *WordPerfect*: 4.1, 4.2, 5.0, and 5.1. It proceeds at a rapid pace and is aimed at teaching you how to create a variety of practical business documents with specific formatting.

The overview is quick, but since the book covers the four versions, you must wade through instructions that do not pertain to your version and deal with some odd transitions. In the discussion on using tabs, Scanlon launches into the tables features. This is natural if you're using the older versions of *WordPerfect* that create tables with tabs, but Version 5.1 automates this task.

You'll find more information on the equation editor and macros in *The WordPerfect Book* than in the other tutorials, although there is a mistake about the length of a macro description: it's 39 characters not 60. The section on merges does not explain how to avoid empty fields—instructions that any primer should cover.

Scanlon covers more *WordPerfect* features in less space than the other books, and he doesn't waste time explaining a concept repeatedly. The *WordPerfect Book* is a fast-paced tutorial that will get you up and running in a hurry.

In 18 lessons, *WordPerfect 5.0/5.1: A Self-Teaching Guide* (John Wiley & Sons, \$19.95) offers a practical approach to *WordPerfect*. College professor Neil Salkind avoids computer terminology in favor of conversational descriptions that are as

concise as possible, but the trade sacrifices detail. Organized by level of complexity, *A Self-Teaching Guide* begins with lessons for creating a document. Brief descriptions of functions are followed up with quick examples. Each lesson ends with an assignment you should be able to complete on your own, and each set of lessons closes with a quiz on the skills you learned in the chapter. It's similar to a textbook, but the answers to the test questions conveniently appear on the same page. The lessons get progressively more difficult as new functions are introduced,

TRAINING TIPS



Split Screens

"Work with two documents at once by retrieving the first on the Doc 1 screen and the second on the Doc 2 screen. Switch between the document screens by pressing Shift-F3 or by selecting from the menu. Split the Typing screen by pressing the SCREEN (Ctrl-F3) key or by selecting Edit (E), Window (W) from the pull-down menu, and then entering the number of lines for the current window. The Doc 1 and Doc 2 text can then be viewed simultaneously. A window size of 11 splits the screen in half."—*WordPerfect 5.1 Made Easy*, by Mella Minberg, page 204.

and the book ends with a brief overview of equations, tables, graphics, and macros.

The sequence of information does not flow in some cases. The discussion on page formatting warns that you can't just enter ^B, which inserts the page number. Instead, you hit Shift-F8, 2, 6, and 3. Two pages later, you learn a time-saving trick to insert a page number: Just hit the Ctrl-B key combination. Helpful tips and definitions are scattered throughout the book, but he fails to warn you about using automatic page numbering together with headers or footers.

WordPerfect 5.1 Made Easy (Osborne McGraw-Hill, \$19.95) takes beginners further into *WordPerfect* features than any other tutorial and includes material to keep the intermediate user busy as well. This edition in author Mella Minberg's series of *WordPerfect* books, combines a reference guide with practical advice to

form a useful instructional format.

WordPerfect installation is covered in depth, and instructions for creating a simple start-up batch file are provided. Since the book progresses from basic to advanced techniques, more-skilled users can skip the first seven introductory chapters and dive right into the advanced lessons on tables and merges.

The lessons begin with function descriptions, stated simply and thoroughly, followed by a simple example. There are also tear-out reference cards for quick reminders of commands and keystrokes, as well as a list of functions and corresponding key combinations. Although Minberg's book is more comprehensive than some other tutorials, she explains easy macros, but leaves the macro programming language—"the ultimate of macro complexity"—to macro-specific books and Acerson's *WordPerfect 5.1: The Complete Reference*.

While most other tutorials are aimed exclusively at inexperienced *WordPerfect* users, *WordPerfect 5.1 Made Easy* covers a broad enough range of *WordPerfect*'s features to hold the interest of users at all levels of expertise.

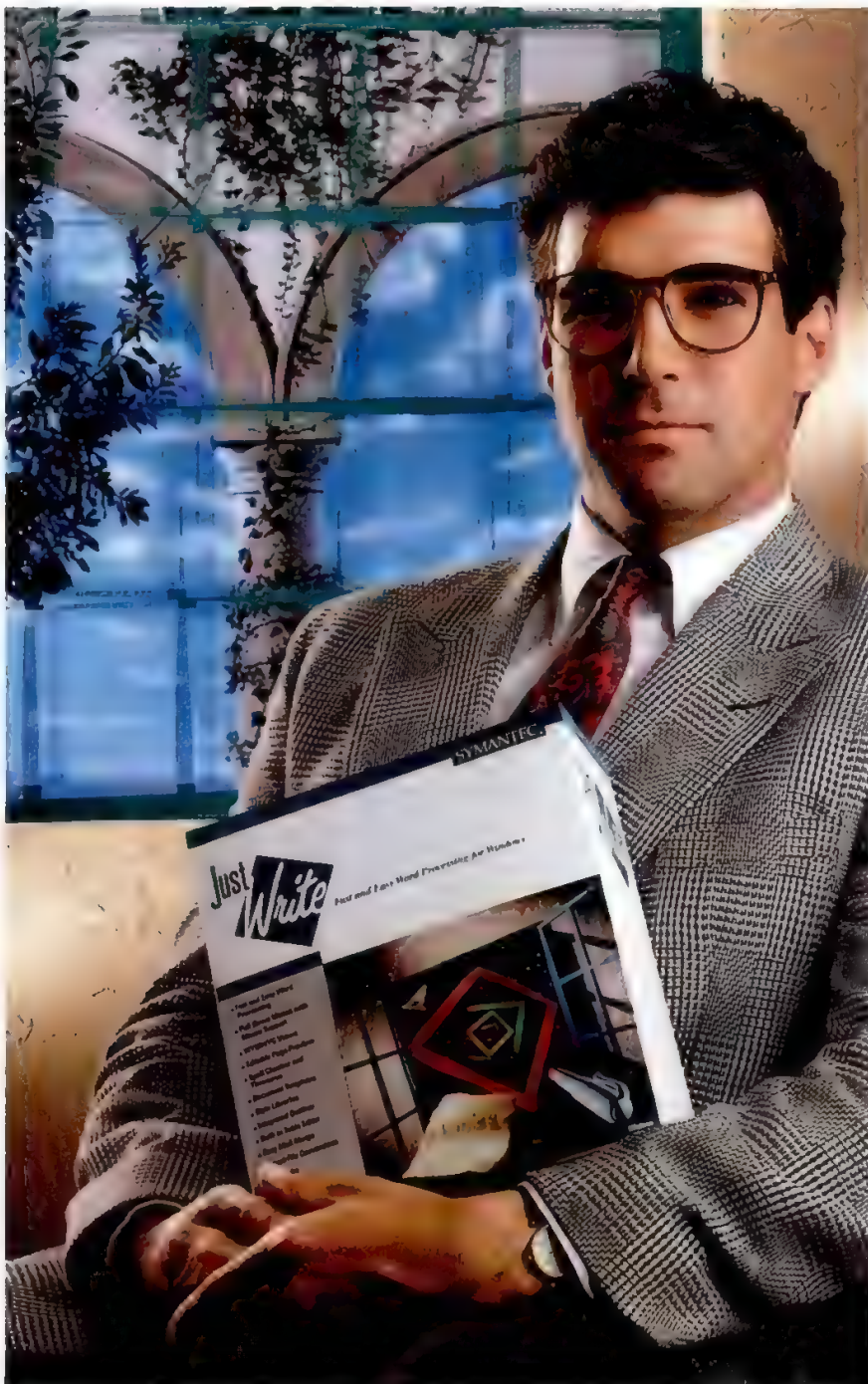
If you're a stranger to word processing, *WordPerfect 5.1 Step-by-Step* (Sams, \$24.95) makes the introduction. Author Judd Robbins brings his expertise as a writer on DOS to his *WordPerfect* tutorial. He explains the fundamental concepts of DOS, storage capacity, and hard disk management in plain English. From the start, he weaves in DOS commands such as CHKDSK, DIR, DISKCOPY, and FORMAT, so you barely notice you're learning computer terminology. Robbins covers most *WordPerfect* functions but does not go into detail on advanced features such as macros, styles, equations, merges, or sorts.

Each chapter lists the subjects to be introduced, followed by descriptions, illustrations, lessons, summaries, and review questions. The design is easy to read, with only a few concepts presented on each page. Some of the chapters, however, are incomplete. For instance, the List Files section includes a careful explanation of Retrieve, Delete, and Copy, but leaves out Find—an option that lets you search files for text patterns.

For practice in working with graphics, columns, and fonts, you can follow along with directions to create a newsletter. There is some detail on the macro editor, but Robbins includes only a few macros

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TRAINING TOOLS

WORDPERFECT BOOKS

for your own macro library. You can order a companion disk containing the demonstration files and macros for \$19.95 and several pocket reference cards for \$5.95 each. The inside front and back covers include charts of shortcut keystrokes and pull-down menu commands.

WordPerfect 5.1 Workbook and Disk (Que, \$29.95) is another book that belongs to the series of Que *WordPerfect* books. It's one of two tutorials that includes a disk of 76 sample documents for you to use in the lessons, and the only book with a spiral binding that will lie flat on your desk. The authors urge you to consult Que's *Using WordPerfect 5.1*, Special Edition to make this tutorial complete.

The step-by-step instructions for working with the disk-based practice documents are easy to follow, and each lesson is followed by a troubleshooting checklist. The book covers editing and page-formatting features, as well as printing, file management, and graphics. Other chapters touch briefly on advanced functions such as the merge commands and macros, but there are no lessons on the programming language. *WordPerfect 5.1 Workbook and Disk* is a focused tutorial that gives you good practice with the most basic *WordPerfect* functions.

WordPerfect PC Tutor (Que, \$39.95) is another disk- and book-based tutorial that covers all the basic features of *WordPerfect*. The floppy disk contains an independent executable tutorial program that mimics *WordPerfect* and document files and macros to use with the lessons. The amply illustrated book includes step-by-step instructions with appropriate figures to help you, but as in *WordPerfect 5.1 Workbook and Disk*, the display typeface for *WordPerfect* program messages is very light and monospaced, making it difficult to read.

The first chapter discusses *WordPerfect* customization, but the installation instructions are located in the appendix. The index is more useful than some found in other books because it refers to all of the function keys that are discussed. As with most tutorials, there are summaries and review exercises at the end of each chapter that reinforce the material.

Like the *WordPerfect 5.1 Workbook and Disk* (also published by Que), *WordPerfect PC Tutor* recommends that you consult Que's *Using WordPerfect 5.1*, Special Edition for more detailed information on *WordPerfect*'s functions.

The ABC's of WordPerfect 5.1, by Alan Neibauer. Sybex Inc., 2021 Challenger Dr., #100, Alameda, CA 94501; 800-227-2346. List Price: \$19.95. Pages: 352 pp. Copyright: 1990. ISBN: 0-89588-672-3.

CIRCLE 403 ON READER SERVICE CARD

Illustrated WordPerfect 5.1, by Jordan Gold. Wordware Publishing Inc., 1506 Capital Ave., Plano, TX 75074; 800-229-4949. List Price: \$23.95. Pages: 470 pp. Copyright: 1991. ISBN: 1-55622-174-6.

CIRCLE 404 ON READER SERVICE CARD

Teach Yourself WordPerfect 5.1, by Mary Campbell. Osborne McGraw-Hill, 2600 Tenth St., Berkeley, CA 94710; 800-227-0900. List Price: \$19.95. Pages: 1,041 pp. Copyright: 1990. ISBN: 0-07-881666-1.

CIRCLE 405 ON READER SERVICE CARD

Teach Yourself WordPerfect 5.1, by Jeff Woodward. Sybex Inc., 2021 Challenger Dr., #100, Alameda, CA 94501; 800-227-2346. List Price: \$21.95. Pages: 444 pp. Copyright: 1990. ISBN: 0-89588-684-7.

CIRCLE 406 ON READER SERVICE CARD

The WordPerfect Book, by Leo J. Scanlon. Windcrest Books, Blue Ridge Summit, PA 17294; 800-822-8138. List Price: \$17.95. Pages: 346 pp. Copyright: 1990. ISBN: 0-8306-3616-1.

CIRCLE 407 ON READER SERVICE CARD

WordPerfect 5.0/5.1: A Self-Teaching Guide by Neil Salkind. John Wiley & Sons Inc., 605 Third Ave., New York, NY 10158; 212-850-6000. List Price: \$19.95. Pages: 366 pp. Copyright: 1991. ISBN: 0-471-52961-3.

CIRCLE 408 ON READER SERVICE CARD

WordPerfect 5.1 Made Easy, by Mella Minberg. Osborne McGraw-Hill, 2600 Tenth St., Berkeley, CA 94710; 800-227-0900. List Price: \$19.95. Pages: 1,071 pp. Copyright: 1990. ISBN: 0-07-881625-4.

CIRCLE 409 ON READER SERVICE CARD

WordPerfect 5.1 Step-by-Step, by Judd Robbins. Sams, Macmillan Computer Publishing, 11711 N. College Ave., Carmel, IN 46032; 800-428-5331, 317-571-3489. List Price: \$24.95. Pages: 578 pp. Copyright: 1990. ISBN: 0-672-22711-8.

CIRCLE 410 ON READER SERVICE CARD

WordPerfect 5.1 Workbook and Disk, by Marianne B. Fox and Lawrence C. Metzelaar. Que, Macmillan Computer Publishing, 11711 N. College Ave., Carmel, IN 46032; 800-428-5331, 317-571-3489. List Price: \$29.95. Pages: 422 pp. Copyright: 1990. ISBN: 0-88022-559-9.

CIRCLE 411 ON READER SERVICE CARD

WordPerfect PC Tutor, by Marianne B. Fox, Lawrence C. Metzelaar, and Susan Hafer. Que, Macmillan Computer Publishing, 11711 N. College Ave., Carmel, IN 46032; 800-428-5331, 317-571-3489. List Price: \$39.95. Pages: 472 pp. Copyright: 1990. ISBN: 0-88022-619-6.

CIRCLE 412 ON READER SERVICE CARD

Tips and Tricks



WordPerfect 5.1 Tips and Tricks
by Alan R. Neibauer



WordPerfect 5.1 Tips, Tricks, and Traps
by Charles O. Stewart III, Joel Shore, and Daniel J. Rosenbaum

Learning all of WordPerfect's complex features may not be worth your time, but knowing how to customize can boost productivity by cutting down on repetitive tasks. If you think you know WordPerfect now, these books will enhance your knowledge so that you understand it even better.

WordPerfect 5.1 Tips and Tricks (Sybex, \$24.95) is not only a source for helpful hints, it's an upgrade reference as well. Now in its fourth edition, this volume is based on Version 5.0, with the new features added to Version 5.1 addressed at the end of each chapter and in the margins. If you're not careful, you'll find yourself tangled with functions that are radically different or missing from Version 5.1.

Alan R. Neibauer writes for experienced and new users, but everyone should be attentive to the Version 5.1 modifications and be sure to read the messages labeled "Warning," "Note," or "New Feature" so that you don't get caught up in learning things the old way.

The first four sections of *Tips and Tricks* are an introduction for beginners, and therefore do not supply many tricks. There are only a few short paragraphs on the hyphenation zone and cursory instructions for changing the default. You will find better explanations of these operations if you refer to *WordPerfect 5.1: The Complete Reference* and *Using*



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answer, page 173

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answer, page 266

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answer, page 98-101

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There's also a two-page fold-out – The Connectivity Decision Matrix – that helps you make the right choices from the first step to the last. This is the book you need if you're connecting a few PCs, networking an office, or responsible for a full corporate network.



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PC Magazine's workgroup system's editor and director of PC LAN Labs, Frank Derfler is the right man for the last word on connectivity. A veteran of more than twenty years with information systems, he's fielded questions from hundreds of readers in his "Connectivity" column in PC Magazine.

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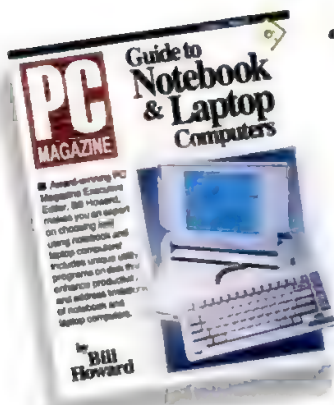
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TRAINING TIPS

■ Convenient Comments

"Use a Comment at the beginning of a document to record the document's revision history. When you write documents that are subject to frequent revision, you may want to record when changes are made and for what reason. Embed this important information in a comment so that it is always immediately accessible."—*WordPerfect 5.1 Tips, Tricks, and Traps*, by Charles O. Stewart III, Joel Shore, and Daniel J. Rosenbaum, page 120.

WordPerfect 5.1, Special Edition.

There is an outstanding discussion on styles and stylesheets and instructions for using the color menu to mix primary colors for output to color printers—a level of detail matched only by Karen L. Acerson's *WordPerfect 5.1: The Complete Reference* and by some of the desktop publishing books evaluated here.

Que assembled a group of *WordPerfect* experts to contribute to *WordPerfect 5.1 Tips, Tricks, and Traps* (Que, \$24.95). Like Neibauer's book, this edition is useful for all skill levels, and the authors are obsessed with being as current as possible. They uncover details of interim releases; for example, you can change *WordPerfect*'s default style for table border lines beginning with the upgrade dating from January 19, 1990.

Tips, Tricks, and Traps organizes its information in nuggets, with tips, tricks, and traps labeled in the margins. Tips appear clearly in bold text and are approximately one sentence long. They read like messages found in fortune cookies: "Be careful with numbers in your secondary merge file when converting to and from Lotus 1-2-3," or "Use 7-bit transfer format when you send *WordPerfect* files by electronic mail." Explanations follow.

The chapters progress from basic setup to complex equations and graphics editing. The Setup section recommends types of EMS drivers and discusses the amount of available RAM. (Information on installing *WordPerfect* on a network is more extensive here than in *Using WordPerfect 5.1, Special Edition*.) Later, you'll find tips on using automatic page numbering, creating pagination styles, and including headers and footers.

TRAINING TOOLS

WORDPERFECT BOOKS

If you make it through the second half of this 745-page tome, you'll be a *WordPerfect* power user. *WordPerfect 5.1 Tips, Tricks, and Traps* is an excellent book that helps all *WordPerfect* users maximize their performance.

WordPerfect 5.1 Tips and Tricks, by Alan R. Neibauer. Sybex Inc., 2021 Challenger Dr., #100, Alameda, CA 94501; 800-227-2346. List Price: \$24.95. Pages: 685 pp. Copyright: 1990. ISBN: 0-89588-681-2.

CIRCLE 413 ON READER SERVICE CARD

WordPerfect 5.1 Tips, Tricks, and Traps, by Charles O. Stewart III, Joel Shore, and Daniel J. Rosenbaum. Que, Macmillan Computer Publishing, 11711 N. College Ave., Carmel, IN 46032; 800-428-5331, 317-571-3489. List Price: \$24.95. Pages: 745 pp. Copyright: 1990. ISBN: 0-88022-557-2.

CIRCLE 414 ON READER SERVICE CARD

Reference



The Best Book of WordPerfect 5.1
by Vincent Alfieri

Encyclopedia WordPerfect 5.1
by Greg Harvey and
Kay Yarrow Nelson

Mastering WordPerfect 5.1
by Alan Simpson

**Using WordPerfect 5.1,
Special Edition**
developed by Que

WordPerfect Bible
by Joseph Speaks and Rob Weinstein



**WordPerfect 5.1:
The Complete Reference**
by Karen L. Acerson

If you're looking to supplement or replace *WordPerfect*'s manual, you have a choice of six books, all of which differ in organ-

izational design and level of expertise.

The Best Book of WordPerfect 5.1 (Hayden/Sams, \$26.95) is a comprehensive guide for new and experienced *WordPerfect* users, but its advice tends to be confusing and misleading. For example, author Vincent Alfieri mistakenly claims that to create a macro within the macro editor you need to define a macro that does nothing and then enter the editor via the usual macro creation keystrokes—this is incorrect for *WordPerfect 5.1*.

The text is illustrated with screen diagrams, tables, and margin icons that draw your attention to tips, examples, questions, warnings, hints, and notes. His conversational tone will be appreciated more by beginners than by experienced users.

The book begins with a laborious discussion of the use of word processors versus the use of typewriters and a section covering DOS basics, disk formatting, and file management. Power users will find helpful information on fonts, graphics, and laser printers, but the desktop publishing discussions do not equal those found in *WordPerfect 5.1: The Complete Reference* or *Using WordPerfect 5.1, Special Edition*.

Encyclopedia WordPerfect 5.1 (Sybex, \$29.95) comes close to being the only one-stop reference to Versions 5.1 and 5.0, with side-by-side instructions for both versions. Each chapter begins with notes on the Version 5.1 upgrade and covers the commands for both versions. The commands are clearly marked and contain explanations of the differences between the two. But this well-illustrated book is best suited for users already familiar with *WordPerfect*, since there are no lessons and only a few examples.

The chapter on graphics and desktop publishing includes troubleshooting advice, instructions for using *DrawPerfect* with *WordPerfect*, and examples of designs and layouts. You'll find excellent explanations of functions such as merges and macros, although there could be more examples. While they do discuss macro commands and the macro programming language (including accurate instructions on creating a macro in the macro editor), those wishing to learn more about macro programming should pick up a copy of *WordPerfect 5.1 Macros and Templates*.

Users who are less experienced with *WordPerfect* and who may never have the desire to be a power user, will prefer the slower pace of **Mastering WordPerfect 5.1** (Sybex, \$26.95) by Alan Simpson.



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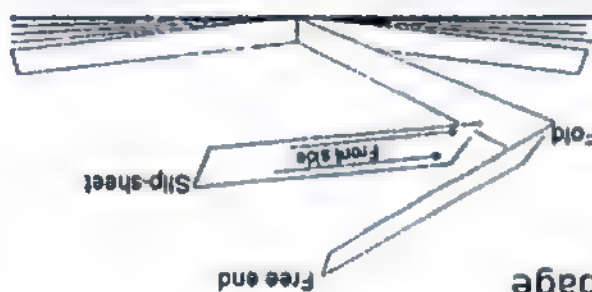
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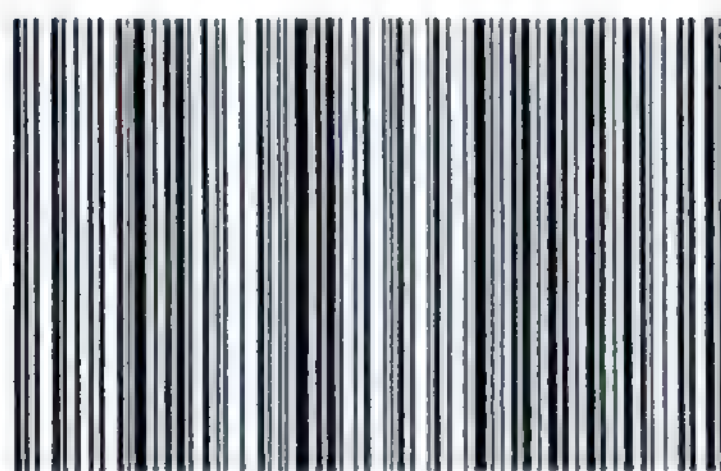
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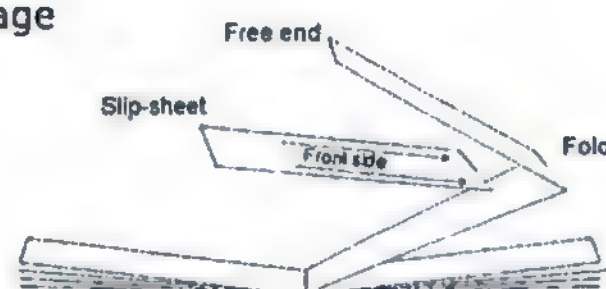
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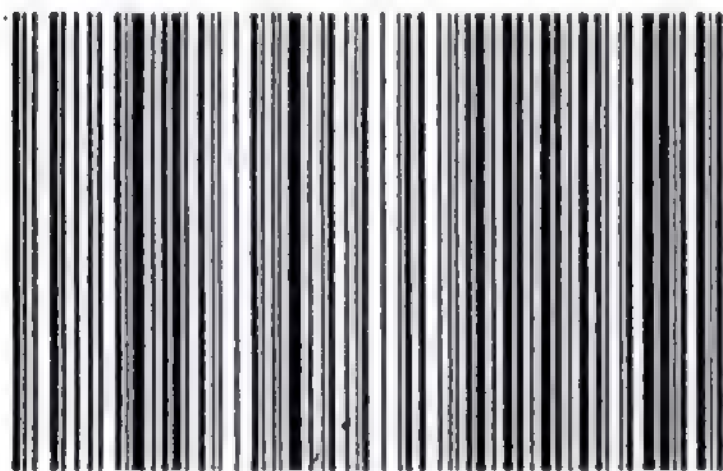
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This book is designated as a supplement to the documentation for beginners and intermediate *WordPerfect* users. Covering more of the basics than *WordPerfect 5.1: The Complete Reference*, *Mastering WordPerfect 5.1* emphasizes techniques for new users rather than power users.

Organized from basic to advanced functions rather than alphabetically, each chapter begins with a quick list of actions and keystrokes that will be introduced in the section, followed by explanations, hands-on examples, and short assignments. Icons located in the margins draw attention to tips, reminders, and potential problems, and each chapter ends with a summary. Simpson makes no assumptions about the reader; one margin note even defines a tab stop.

Although it is 1,044-pages long, *Mastering WordPerfect 5.1* is not a definitive resource; for example, it only briefly covers advanced macro programming. However, this book contains some of the best illustrations—many in color—found in any of the books in this category. You will also find an elaborate tear-out card of function key combinations and menus that you can fold into a triangle and keep on your desk.

Using WordPerfect 5.1, Special Edition (Que, \$27.95) is designed as a complete introduction to *WordPerfect*, yet it encompasses much more than the basics. Que reserves much of the power techniques for its *WordPerfect 5.1 Tips, Tricks, and Traps*, but this book remains a definitive resource for any *WordPerfect* user.

Like many of the Que books, this is a compilation of writings from numerous *WordPerfect* experts. *Using WordPerfect*'s style is consistent, though some chapters include references to commands before they are explained. Structured by level of complexity rather than alphabetized by function, the book begins with a thorough look at installation, and then progresses to macro programming, merges, sorting, and desktop publishing, with a special focus on formatting documents, using fonts and styles, and using laser printers.

Many of the chapters are excerpts from *Using WordPerfect 5.0*, but they have been rewritten to reflect the Version 5.1 enhancements. There is an important note about a maintenance upgrade released after the initial shipping of Version 5.1, and you will find a tear-out command chart for quick reference.

The most recent *WordPerfect* refer-

ence book is *WordPerfect Bible* (Waite Group Press, \$26.95) by Joseph Speaks and Rob Weinstein. Subtitled *The Definitive Visual Reference*, the book is intended to be comprehensive and intuitive, yet its scope does not reach the expert level. Where Acerson's reference devotes over 140 pages to macros and merges, *WordPerfect Bible* covers them in about 20 pages and calls them complex and difficult to learn.

TRAINING TIPS

■ How to Restore Deleted Text

Question: "What if I delete text by mistake?" Answer: "Restore deleted text by pressing Cancel (F1) and then choosing 1 for Restore. If you made other deletions in the meantime, choose 2 to see Previous deletions until you find what you are looking for. Remember that you can restore only the last three deletions."—*WordPerfect 5.1: The Complete Reference*, by Karen L. Acerson, page 66.

A compact and dense volume, *The WordPerfect Bible* follows a strict formula, with chapters corresponding to *WordPerfect*'s pull-down menu items: File, Edit, Search, Layout, Mark, Tools, Font, Graphics, and Help. Intermediate users who know the menu structure will find this layout convenient and the text fast-paced.

Who would know more about *WordPerfect* than Karen L. Acerson? Former manager of WordPerfect Corp.'s highly regarded customer support department, *WordPerfect* trainer for large corporate accounts, and author of several *WordPerfect* books, Acerson has written the most complete reference volume on the program: *WordPerfect 5.1: The Complete Reference*. Acerson's experience with customer problems has allowed her to bring unique insight to this highly readable 1,370-page volume. *WordPerfect* users at any level will find the book to be a valuable reference and learning guide.

The structure of *The Complete Reference*, like the *WordPerfect* manual, is organized alphabetically by function, but is supplemented with alternative methods, examples, and tips. Each function is

followed by a description, step-by-step instructions, screen illustrations, hints, and related features. All the other reference books miss entries that Acerson includes as a matter of course.

Following the reference section are chapters for more-advanced *WordPerfect* users, including an excellent review of desktop publishing in which Acerson provides instructions for kerning letters manually if your font doesn't provide the tables for kerning pairs. She also explains desktop publishing terms and offers design tips for newsletters. Acerson takes an exhaustive look at advanced programming with macros and merges—concepts directed at expert users, yet clear enough for any user to benefit from. (You can order a \$15 disk with Acerson's macros.)

According to a company representative, WordPerfect Corp.'s customer support department relies on Acerson's book more than the program's manual. Maybe you should too.

The Best Book of WordPerfect 5.1, by Vincent Alfieri. Sams/Hayden, Macmillan Computer Publishing, 11711 N. College Ave., Carmel, IN 46032; 800-428-5331, 317-571-3489. List Price: \$26.95. Pages: 826 pp. Copyright: 1989. ISBN: 0-672-48467-6.

CIRCLE 415 ON READER SERVICE CARD

Encyclopedia WordPerfect 5.1, by Greg Harvey and Kay Yarborough Nelson. Sybex Inc., 2021 Challenger Dr., #100, Alameda, CA 94501; 800-227-2346. List Price: \$29.95. Pages: 1,100 pp. Copyright: 1990. ISBN: 0-89588-676-6.

CIRCLE 416 ON READER SERVICE CARD

Mastering WordPerfect 5.1, by Alan Simpson. Sybex Inc., 2021 Challenger Dr., #100, Alameda, CA 94501; 800-227-2346. List Price: \$26.95. Pages: 1,044 pp. Copyright: 1990. ISBN: 0-89588-670-7.

CIRCLE 417 ON READER SERVICE CARD

Using WordPerfect 5.1, Special Edition, by Que. Que, Macmillan Computer Publishing, 11711 N. College Ave., Carmel, IN 46032; 800-428-5331, 317-571-3489. List Price: \$27.95. Pages: 942 pp. Copyright: 1989. ISBN: 0-88022-554-8.

CIRCLE 418 ON READER SERVICE CARD

WordPerfect Bible, by Joseph Speaks and Rob Weinstein. Waite Group Press, 100 Shoreline Hwy., Suite A-285, Mill Valley, CA 94941; 415-331-0575. List Price: \$26.95. Pages: 546 pp. Copyright: 1991. ISBN: 1-878739-01-8.

CIRCLE 419 ON READER SERVICE CARD

WordPerfect 5.1: The Complete Reference, by Karen L. Acerson. Osborne McGraw-Hill, 2600 Tenth St., Berkeley, CA 94710; 800-227-0900. List Price: \$24.95. Pages: 1,327 pp. Copyright: 1990. ISBN: 0-07-881634-3.

CIRCLE 420 ON READER SERVICE CARD

Upgrade Guides



WordPerfect from 5.0 to 5.1
by Karen Acerson

The sole purpose of *WordPerfect from 5.0 to 5.1* (\$17.95, Osborne McGraw-Hill) is to describe Version 5.1's new features and to explain the differences between Version 5.0 and Version 5.1. Karen Acerson is an accurate and articulate author, and if other books don't answer all your questions about the differences between the two versions, this is the place to look.

This 430-page book may be especially helpful for consultants who advise clients on upgrading. Acerson provides a section of common support questions and summarizes the new features, which include tables, spreadsheet support, and the equation editor. Illustrations show these features in action.

There is a chapter on installation and setup, which changed significantly in Version 5.1, and it includes complete instructions for basic, custom, and network installations. Acerson also explains how to choose mouse and printer drivers, and set up fonts.

The format is modeled after Acerson's complete reference volume *WordPerfect 5.1: The Complete Reference*, including a thorough index, A-Z design, and useful appendixes. The information is accurate and easy to find, but if you want more in-depth coverage of all *WordPerfect* 5.1 aspects, then you should look at Acerson's *Complete Reference*.

WordPerfect from 5.0 to 5.1, by Karen L. Acerson. Osborne McGraw-Hill, 2600 Tenth St., Berkeley, CA 94710; 800-227-0900. List Price: \$17.95. Pages: 430 pp. Copyright: 1990. ISBN: 0-07-881622-X.

CIRCLE 421 ON READER SERVICE CARD

TRAINING TOOLS

WORDPERFECT BOOKS

Macros



WordPerfect 5.1 Macro Handbook
by Kay Yarborough Nelson

WordPerfect 5.1 Macros
by Donna M. Mosich, Robert Bixby, and Pamela Adams-Regan

PC MAGAZINE **WordPerfect 5.1 Macros and Templates**
by Gordon McComb

WordPerfect 5.1 Power Pack
by Peter G. Randall and Steven J. Bennett

WordPerfect Macros
by Maria A. Hoath

Like programming, macro writing is an art. With a little dedication, effort, and WordPerfect's macro writing capabilities you can transform WordPerfect into your own customized tool. But the authors of the five books reviewed in this section have done much of the hard work for you. Four of these books even come with floppy disks packed with ready-to-run macros.

The emphasis of *WordPerfect 5.1 Macro Handbook* (Sybex, \$24.95) is on creating macros without using all of the macro programming language, which makes it a good book for *WordPerfect* users at any level. But author Kay Yarborough Nelson suggests that you have some programming experience to use the language successfully. She provides step-by-step instructions for writing macros in Version 5.0 and Version 5.1, and clearly highlights the differences between the two versions.

The book begins with simple macros that automate saving, printing, starting, exiting, and advances to inserting and deleting codes using the macro editor. Nelson then instructs you in more complex tasks such as searching and replacing codes.

There are interesting chapters on using soft macro keyboards and on using the Merge Command Language to execute macros for menu creation. The comprehensive appendix describes the macro programming language and includes charts of control characters, special character sets, ASCII Character and Code Equivalents, and an A-to-Z reference for all commands.

Although *WordPerfect 5.1 Macro Handbook* is the only one of the macro books reviewed here that does not include a collection of macros on a floppy disk, it does provide you with insightful and useful ideas for good macro writing.

In addition to being one of the best general introductions to macro programming, *WordPerfect 5.1 Macros* (Windcrest Books, \$26.95) features information on style and merge commands. Although the book is thorough enough to cover the reader range from novice to expert, the authors don't describe all of *WordPerfect*'s features, so you should have a working knowledge of *WordPerfect* before using this book.

The book's accompanying floppy disk holds 225 macros, styles, and templates, and the inside front cover features a convenient summary of macro commands. The two appendixes include a list of *WordPerfect* add-on products, in addition to the macros and styles covered in the book.

Unlike the other books in this category, *WordPerfect 5.1 Macros* quickly advances to the complex topics, spending little time on simple macros. Each of the macros are followed by step-by-step creation instructions for Version 5.1. But, not all of the facts about Version 5.1 enhancements have been checked thoroughly. The authors make the mistake of claiming that you must define a macro before you enter the editor—not true—and that a Fast Save in Version 5.1 will not format a document so that you can print from disk.

An A-to-Z reference for macro commands, including tables of control characters, font attribute characters, operators, and variables is provided, but you may question the logic and usefulness of some of the entries.

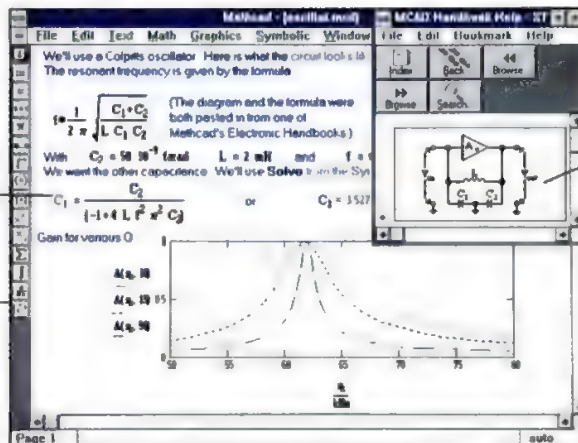
Gordon McComb's *WordPerfect 5.1*

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TRAINING TOOLS
WORDPERFECT BOOKS

Macros and Templates (Bantam Computer Books, \$39.95), which won the 1991 Computer Press Association award for Best Product-specific book, provides better examples of time-saving macro techniques, but this book is definitely not for beginners. McComb expects readers to have an adequate working knowledge of *WordPerfect*, such as editing text, formatting through text codes, and printing documents. The book does explain what macros and templates are and how to use them.

Macros and Templates begins with the macro writing basics. Each command is accompanied by an explanation, an example, and step-by-step instructions, and each chapter ends with a summary of the topics covered. Like *WordPerfect 5.1 Macro Handbook*, this book succinctly explains how to use the editor to edit defined macros and how to create new macros.

You'll find an abundance of power tips clearly separated from the text for skimmability, and the screen illustrations are the best of all five macro books. The screen illustrations from the editor are an exact representation of a macro display. A valuable table of *WordPerfect* macro editing codes and commands is also included.

McComb doesn't promise to teach you programming, but he does provide a list of fundamentals such as flow control, routines, subroutines, variables, expressions, strings, conditional statements, and branching to help you think like a programmer. To help clarify the macro commands, there is a chart that categorizes the commands into discrete types.

Other chapters cover keyboard layout creation, merging, and menuing systems, and the book ends with several macro applications including boilerplate correspondence, law forms, invoices, mailing labels, and a fun section on macro extras—calculator, quiz game, time tracker, and a blackjack game. All 300 macros come on two floppy disks.

The WordPerfect 5.1 Power Pack (Brady Computer Books, \$39.95) is another general information macro book, but it does not teach you how to use the macro language. Some knowledge of *WordPerfect*'s basic features is required to follow Peter G. Randall and Steven J. Bennett's instructions for programming macros. The book includes plenty of screen illustrations and comes with a floppy disk containing 200 ready-to-run macros, most of which are more useful than those in-

cluded with *WordPerfect 5.1 Macros*.

Each chapter focuses on a macro from the floppy disk. There is a concise description of the macro's function and a screen illustration of the macro in the macro editor. There are no step-by-step instructions for recreating the macro, and there is absolutely no information about using the editor or the macro language.

WordPerfect 5.1 Power Pack is targeted at *WordPerfect* users who are experienced enough to understand what a macro does simply by viewing its text. That requires a familiarity with many *WordPerfect* commands and probably a reference book with a complete list of keystrokes as well. However, if you have the knowledge and the need for the ready-to-run macros, this book will be a helpful addition to your library.

WordPerfect Macros (Wordware Publishing, \$11.95) is a sparsely illustrated 116-page guide to easy *WordPerfect* macros, featuring a floppy disk with 45 macros. Definitely not recommended for power users, this book is a well-organized step-by-step macro teacher for those without macro experience.

Author Maria A. Hoath explains that the reason for using macros is to save time, automate tasks, and to prevent keystroke duplication. The introduction describes the role and types of macros and recommends that you plan macros on paper instead of on-screen to avoid errors—not exactly a time-saving strategy. She never mentions that you can use the editor to correct mistakes.

WordPerfect 5.1 Macro Handbook, by Kay Yarbrough Nelson. Sybex Inc., 2021 Challenger Dr., #100, Alameda, CA 94501; 800-227-2346. List Price: \$24.95. Pages: 532 pp. Copyright: 1990. ISBN: 0-89588-687-1.

CIRCLE 422 ON READER SERVICE CARD

WordPerfect 5.1 Macros, by Donna M. Mosich, Robert Bixby, and Pamela Adams-Regan. Windcrest Books, Blue Ridge Summit, PA 1794-0850; 800-822-8138. List Price: \$26.95. Pages: 422 pp. Copyright: 1990. ISBN: 0-8306-3617-X.

CIRCLE 423 ON READER SERVICE CARD

WordPerfect 5.1 Macros and Templates, by Gordon McComb. Bantam Computer Books, 666 Fifth Ave., New York NY 10103; 212-765-6500. List Price: \$39.95. Pages: 663 pp. Copyright: 1990. ISBN: 0-553-34875-2.

CIRCLE 424 ON READER SERVICE CARD

WordPerfect 5.1 Power Pack, by Peter G. Randall and Steven J. Bennett. Brady Computer Books, Simon & Schuster Inc., 15 Colum-

bus Circle, New York, NY 10023; 212-373-8052. List Price: \$39.95. Pages: 299 pp. Copyright: 1990. ISBN: 0-13-965808-4. CIRCLE 425 ON READER SERVICE CARD

WordPerfect Macros, by Maria A. Hoath. Wordware Publishing Inc., 1506 Capital Ave., Plano, TX 75074; 800-229-4949. List Price: \$11.95. Pages: 116 pp. Copyright: 1991. ISBN: 1-55622-186-X.

CIRCLE 426 ON READER SERVICE CARD

Desktop Publishing



Desktop Publishing with WordPerfect 5.1
by Rita Belserene

Desktop Publishing with WordPerfect for 5.0 and 5.1
by Roger C. Parker

Fast Access/Desktop Publishing with WordPerfect 5.0 and 5.1
by Rhyder McClure and Steven Cherry

WordPerfect Desktop Publishing in Style
by Daniel Will-Harris

"WordPerfect gives word processing a new respectability," says design expert and author Roger C. Parker, referring to the *WordPerfect* design tools that bring page composition techniques to word processing. These four books explore *WordPerfect*'s desktop publishing capabilities and the principles of good design—two necessities for effective documents.

Desktop Publishing with WordPerfect 5.1 (Sybex, \$24.95) follows a well-organized progression from the elements of a published page and *WordPerfect*'s desktop publishing abilities, to exercises

for creating finished documents. To help you appreciate the art of typography, author Rita Belserene devotes 70 pages to fonts. You'll learn how to create visual interest by using lines and boxes, graphics and text, and creating stylesheets.

Each chapter is preceded by a summary of concepts called Fast Tracks—a helpful reinforcement technique used in all Sybex books for those who tend to skip around.

Basic features such as justification, tab stops, document codes, and macros are covered, but you still need good general knowledge of *WordPerfect* to get the most out of this book.

Like Daniel Will-Harris's *WordPerfect Desktop Publishing in Style*, Belserene's book features documents you can create by following exercises. They start out simple and progress to more complex newsletters and flyers, with more focus on details than in some of the other books. For a well-organized, comprehensive guide, you can't go wrong with *Desktop Publishing with WordPerfect 5.1*.

It's clear from the start that Roger C. Parker, author of *Desktop Publishing with WordPerfect for 5.0 and 5.1* (Ventana Press, \$21.95), is a desktop publishing expert. He shares his experience in advertising and marketing as he does in his other design and publishing books like *Looking Good in Print: A Guide to Basic Design for Desktop Publishing*. He considers *WordPerfect* to be great for projects that aren't too design-intensive.

Parker approaches desktop publishing from a design and layout perspective rather than feature-by-feature. The style is easy to understand, but Parker assumes that you have a working knowledge of *WordPerfect*. The book jumps right into graphics, manipulating text and graphics, printer support, borders, and white space. There is one chapter devoted to typographic refinements, another to using stylesheets for consistency, and another on advanced techniques such as using macros to automatically create borders. Every concept is well illustrated with a thumbnail sketch, screen shot, or typographic detail.

If you design newsletters, you will appreciate the section on multicolumn layouts. It includes a discussion of type sizes, vertical rules, moving between columns, and making headlines. Graphics coverage includes design suggestions about using white space around a graphics box and resizing graphics images.

The appendixes include a bibliography, an annotated list of hardware and software vendors who provide enhancements, a resource list of user groups and workshops, and a glossary of desktop publishing terms. If you're serious about desktop publishing, you'll appreciate the scope of *Desktop Publishing with WordPerfect for 5.0 and 5.1*.

Fast Access/Desktop Publishing with WordPerfect 5.0 and 5.1 (Brady Computer Books, \$14.95) is an A-to-Z reference guide designed to get users already acquainted with *WordPerfect* familiar with desktop publishing basics.

TRAINING TIPS



■ A Sense of Style

"Consistency of style is an important goal when producing print communications. Consistent type treatments, letter and line spacing, and page formatting improve the appearance and the effectiveness of your project."—*Desktop Publishing with WordPerfect for 5.0 and 5.1*, by Roger C. Parker, page 163.

Rhyder McClure and Steven Cherry provide a short but useful overview of desktop publishing concepts, followed by a reference section of feature descriptions and keystroke instructions. Many of the topic headings are based on desktop publishing conventions and are not necessarily *WordPerfect* command names or conventions. For instance, there are definitions for baseline placement of typesetters, large character first, crop marks, reverses, and rotations.

Although there is intentional repetition of tasks throughout the chapters, you should be familiar with *WordPerfect* before using this book.

Imagine 645 pages dedicated to desktop publishing in *WordPerfect*; then imagine that those pages were penned by a former television and musical theater writer. The result is *WordPerfect Desktop Publishing in Style* (Peachpit Press, \$23.95), one of the most thorough and lively guides on the topic.

Daniel Will-Harris takes a relaxed, narrative approach to teaching design concepts, but you should have a good working knowledge of *WordPerfect* before reading this book. The aim is to teach

you to create several types of professional and leisure-time documents in *WordPerfect*. The first four chapters are long desktop publishing lessons loaded with design tips and illustrations. Plentiful as they are, the tips aren't as helpful professionally as those found in Parker's book, but Will-Harris does go through the design process from start to finish.

There are separate lessons for simple and complex document design in *WordPerfect*, Version 5.0 or Version 5.1. The point is to familiarize you with the features through step-by-step examples, and having you replicate those examples with menus, calendars, invoices, newsletters, financial reports, invitations, and flyers. The section is creative, so if you're running out of ideas and you need a little hand holding, this is the place to turn.

In other chapters, Will-Harris dissects *WordPerfect*'s measurement system, typefaces and fonts, columns, tables, styles, and graphics. There are excellent backgrounders written in a clear but long-winded style. There are also chapters on *DrawPerfect*, paint programs, spreadsheets, and *WordPerfect* accessories, and the last page of the book is an order form for Will-Harris' \$39.95 floppy disk of stylesheets for "design-impaired *WordPerfect* users."

Desktop Publishing with WordPerfect 5.1, by Rita Belserene. Sybex Inc., 2021 Challenger Dr., #100, Alameda, CA 94501; 800-227-2346. **List Price:** \$24.95. **Pages:** 418 pp. **Copyright:** 1990. **ISBN:** 0-89588-481-X.

CIRCLE 427 ON READER SERVICE CARD

Desktop Publishing with WordPerfect for 5.0 and 5.1, by Roger C. Parker. Ventana Press, P.O. Box 2468, Chapel Hill, NC 27515; 919-942-0220. **List Price:** \$21.95. **Pages:** 306 pp. **Copyright:** 1990. **ISBN:** 0-940087-47-2.

CIRCLE 428 ON READER SERVICE CARD

Fast Access/Desktop Publishing with WordPerfect 5.0 and 5.1, by Rhyder McClure and Steven Cherry. Brady Computer Books, Simon & Schuster Inc., 15 Columbus Circle, New York, NY 10023; 212-373-8052. **List Price:** \$14.95. **Pages:** 239 pp. **Copyright:** 1990. **ISBN:** 0-13-306952-4.

CIRCLE 429 ON READER SERVICE CARD

WordPerfect Desktop Publishing in Style, by Daniel Will-Harris. Peachpit Press, 1085 Keith Ave., Berkeley, CA 94708; 415-527-8555. **List Price:** \$23.95. **Pages:** 645 pp. **Copyright:** 1990. **ISBN:** 0-938151-15-0.

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Janet Rubenking is a California-based free-lance writer specializing in word processing and PC entertainment topics.

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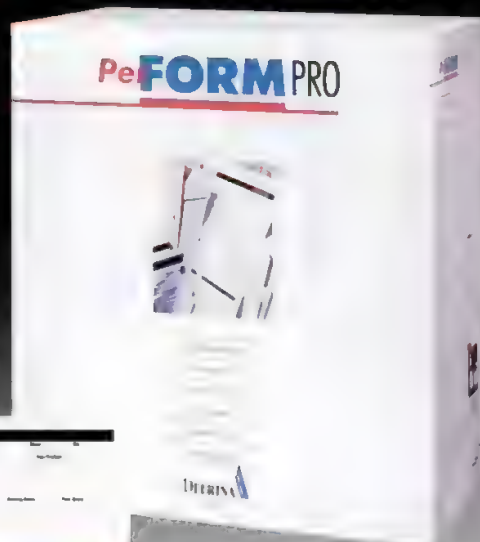
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CIRCLE 144 ON READER SERVICE CARD

by
Michael J. Mefford

Utilities

Word processing files with .DOC extensions spread like dandelions and are almost as hard to get rid of. Just install your favorite word processor, and its directory will shortly sprout innumerable document files. I know mine did; have you looked at yours lately?

Most of these documents quickly lose their value. Keeping them wastes disk space and makes it hard to find the files you really need. But uprooting them before they multiply is far from easy. With only an eight-letter description, you usually can't remember what a given file contains after a week, so you must look inside each document before you dare consign it to oblivion.

The problem is that weeding with your word processor takes more time than you have. It entails entering a whole series of keystrokes to load the files one at a time, followed by another set of keystrokes to close and delete each unwanted item. Even with creative key macros (which may take more time to create than they'll ever save) the task is formidable enough to keep putting off—until you get this issue's free utility.

FILECTRL is a document file maintenance utility that makes pruning a pleasure. It displays the filenames in a directory and the contents of the highlighted file in adjacent windows. As quickly as you scroll the highlight bar down the file list on the left, the texts—also scrollable—appear on the right. You can delete or keep files individually as you go, or you can selectively mark a number of files to be removed as a group.

FILECTRL differs from seemingly similar utilities (including my own DR program) in that the latter can display files only in ASCII format. Unfortunately, the proprietary codes most word processors use for file headers and formatting commands can turn such files into gobbledygook when you look at them with an ASCII viewer. FILECTRL, however, recognizes *WordPerfect*, *Microsoft Word*, and *Q&A* documents as such, skips you past their headers, and filters out their spe-

Weed Out Your Overgrown Directories With FILECTRL.COM

■ FILECTRL is a file-viewing and -deletion utility that handles *WordPerfect*, *Word*, *Q&A*, and *WordStar* documents as if they were ASCII.

cial in-text format characters. This makes their texts immediately readable from the top, so you can quickly decide what to do with a file. And if you're accustomed to working with more than 25 lines at a time, you'll be glad to know that FILECTRL supports the EGA 43-line and VGA 50-line modes, and *UltraVision*, too.

You can download a copy of FILECTRL.COM file from PC MagNet, as explained in the PC MagNet News page following this article. If your communications setup can't handle executable files, you can download FILECTRL.BAS. Running this file in BASIC will create FILECTRL.COM on your disk. The source code, FILECTRL.ASM, is also available from PC MagNet. If you don't have a modem at all, you can get a copy of the *source code* by mail or fax. Simply send a postcard with your name and address (or fax number if applicable) to the attention of Katherine West, Utilities, *PC Magazine*, One Park Avenue, New York, NY 10016; no phone calls, please.

USING FILECTRL

The syntax for executing FILECTRL is

```
FILECTRL [filespec] [options]
```

Entered without either of its optional parameters, FILECTRL displays the filenames in the current directory in ascending alphabetical order. The *filespec* parameter lets you specify the drive and directory whose files you want to examine. Within the designated directory, the DOS ? and * wildcards can be used to select the files you want displayed. Thus, for example, if you enter

```
FILECTRL F:\PCMAG\*.BAK
```

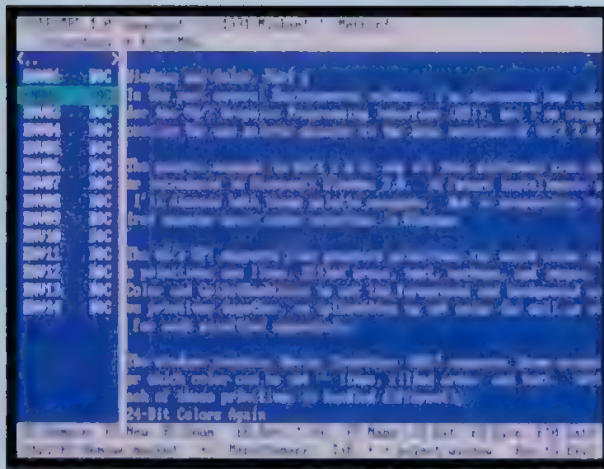
FILECTRL will limit its operations to the backup files in the PCMAG directory on drive F:.

Figure 1 shows a typical FILECTRL initial screen. Either the Tab or the Left and Right Arrow keys let you flip between the file list and the text windows. The currently active window is always displayed in boldface. The Up and Down Arrow, Page Up and Page Down, and Home and End keys all let you navigate within the active window. Although a few antiquated monitors can't display high-intensity colors, pressing any of the paging keys will tell you immediately where you are. Further, you can change any or all of the default colors FILECTRL uses by following the instructions in the sidebar "Customizing FILECTRL." Pressing Esc at any point exits FILECTRL and returns you to the DOS prompt.

As you scroll down the file list on the left, the text of each highlighted filename at which you stop is displayed. When the file list window is active, instead of scrolling through it with the paging keys, you can press the first letter of a filename to jump directly to the right area. Each press

Utilities

Figure 1: The initial FILECTRL windows can be switched to show more text or more file directory information. Both the subdirectory and the parent (<..>) directory files can be accessed without leaving FILECTRL.



of the same letter will take you to the next filename beginning with that letter. FILECTRL will beep if it fails to find any matching filenames.

The initial file list window occupies 14 characters, leaving 65 for the text. If your document is wider than this, just press Enter and the text window of the highlighted file will expand to the full 80 columns of the screen. Hit Enter again, and you'll be back to the two-window display. If you want to see the full DOS directory listing for a file, just press F5, the Zoom key. The file list window will then expand to the half-screen width needed to display the size, date, and time information. F5 is a three-way switch: Expand the file list; expand the text window; return to normal. By pressing and holding one of the Shift keys and then pressing F5 you can reverse the order of the zoom sequence.

Although this initial version of FILECTRL does not implement word wrap, the ability to toggle its 80-column mode with the Enter key alone makes FILECTRL very easy to use as a file-viewing utility. It's especially convenient for reading the stream of e-mail with which we are all bombarded. With NumLock off, you simply rest your right hand on the keypad navigation keys. Then run up and down the file list with the arrow keys, and when a file of interest comes up, hit the keypad Enter key with the little finger of the right hand to zoom the text to full screen. Another pop of the pinkie takes you back to the file list.

You can mark a file for eventual deletion and simultaneously move the high-

light bar to the next file by hitting the Plus (+) key. If you change your mind, you can unmark the file with the Minus (–) key. Again, these steps are easily accomplished when you're working at the numeric keypad. As an alternative, pressing the Spacebar will toggle the mark on and off. The mark itself is a small arrow that appears next to the filename.

This initial version of FILECTRL does not implement word wrap, but the ability to toggle its 80-column mode with the Enter key makes it a good file-viewing utility.

When you've marked the files you want to delete, pressing Ctrl-F2 will remove them. As a safety precaution, you'll be asked to confirm your decision by pressing Y in answer to the prompt. And once the marked-file deletion process begins, you can abort it by pressing any key.

You can delete the currently highlighted file without bothering to mark it by

pressing the F2 function key. Again, to prevent any accidents, FILECTRL will ask you to confirm by pressing Y. Hitting any other key at this point will abort the deletion process.

Since you have two different remove options, as you go down the file list marking files for possible removal and see one you definitely want to delete, you can do so by pressing F2 without interrupting your marking process.

FILECTRL also has some directory-handling capabilities. Subdirectories are indicated by the angle brackets (< >) around their names in the file list. Pressing Enter on a subdirectory will give you a listing of its files, among which will be a <..> (dot-dot) entry. The dot-dot stands for the parent directory of the current subdirectory, and every directory file list other than the root directory contains a parent entry. Pressing Enter on the dot-dot entry will return you to the parent directory file list and place the highlight bar on the previous subdirectory.

This gives you a way to move up and down a directory path, weeding as you go, without leaving FILECTRL. F2 can remove an empty subdirectory without further ado. To get rid of a subdirectory that still has files in it use the following procedure:

- (1) Load the subdirectory file list by pressing Enter on the subdirectory name;
- (2) mark and remove all the files with Ctrl-F2;
- (3) return to the parent directory by pressing Enter on the dot-dot entry;
- (4) remove the subdirectory with F2.

If the subdirectory has other branches, you can go even higher into the tree and repeat the above process. But for heavy-duty directory elimination, it might be easier simply to download my PRUNE directory utility from PC MagNet if you haven't done so already. Note that FILECTRL will beep if it cannot remove a file or directory. In the latter case, the directory is probably not empty.

If you want to shift to another drive or path, pressing F3 will let you enter a new *filespec* exactly as if you were at the DOS prompt. Between the two options, using F3 and pressing Enter on a subdirectory name, you can quickly jump around a disk without ever leaving FILECTRL.

The F6 Sort key changes the direction in which the file list is sorted. By default, FILECTRL sorts filenames in ascending alphabetical order. Pressing F6 reverses the list, putting Z at the top. F6 is a toggle,

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CIRCLE 368 ON READER SERVICE CARD

CODE A04

CUSTOMIZING FILECTRL

Michael J. Metford

Some systems, especially laptops, do not display color contrasts well. If you find FILECTRL hard to read you can force FILECTRL to use black-and-white attributes by entering the command `MODE BW80` before running FILECTRL. The best way to do this is from a batch file such as

```
MODE BW80
FILECTRL %1 %2
```

The *filespec* and *options* parameters you add after the batch filename will replace the %1 and %2 variables in the batch file.

On the other hand, if you have a color system and FILECTRL comes up using black-and-white attributes, chances are some other application has changed the video mode. To encourage FILECTRL to use color, issue the DOS command

```
MODE C080
```

before running FILECTRL.

The following instructions will enable you to customize the colors used by FILECTRL. Be sure to make a backup copy of FILECTRL.COM before you make any changes, and then enter

```
DEBUG FILECTRL.COM
```

You're now ready to modify FILE-

CTRL.COM. If at any time you make a mistake, just abort the editing process by entering Q. Remember too that the last two commands that you enter after entering any modifications through DEBUG are

```
W
Q
```

These write the changed file to disk and quit DEBUG.

CHANGING THE COLOR SCHEME

Enter the following DEBUG (E)nter instructions, replacing the *xx* with a hexadecimal color value. The default color values and descriptions that FILECTRL uses are to the left of each address in Figure A.

Alternative colors may be selected from the following list. The background color number is entered for the first *x* and the foreground color for the second *x*. Do not use a light color for the background or you'll get a blinking display.

Dark colors	Light colors
-----	-----
0 Black	8 Dark gray
1 Blue	9 Light blue
2 Green	A Light green
3 Cyan	B Light cyan
4 Red	C Orange
5 Magenta	D Violet
6 Brown	E Yellow
7 Light gray	F White

Thus, if you would like to change the blue on cyan (31) to red on blue (14) you would enter

```
E 10B 14
```

You should note that FILECTRL turns on the border, which some monitors can't handle. In order to disable the border, just enter

```
E 115 1
```

You can replace the 1 with a 0 to re-enable the border.

SORT ORDER

You can change the default sort direction and sort field with command line switches. Here, I'll show you how to make those changes permanent so that you don't have to type them in each time. Note that you will still be able to change the sort order from the FILECTRL menu.

To change the sort direction, enter the following line:

```
E 116 xx
```

where *xx* is 00 for ascending and 03 for descending order.

To change the sort field, enter

```
E 118 yy
```

where *yy* can be replaced by any of the following hex values:

- 00 for name field
- 04 for extension field
- 08 for size field
- 0C for date field
- FF for original DOS order

After you've finished making all your changes, just type

```
W
Q
```

This step will end your DEBUG session.



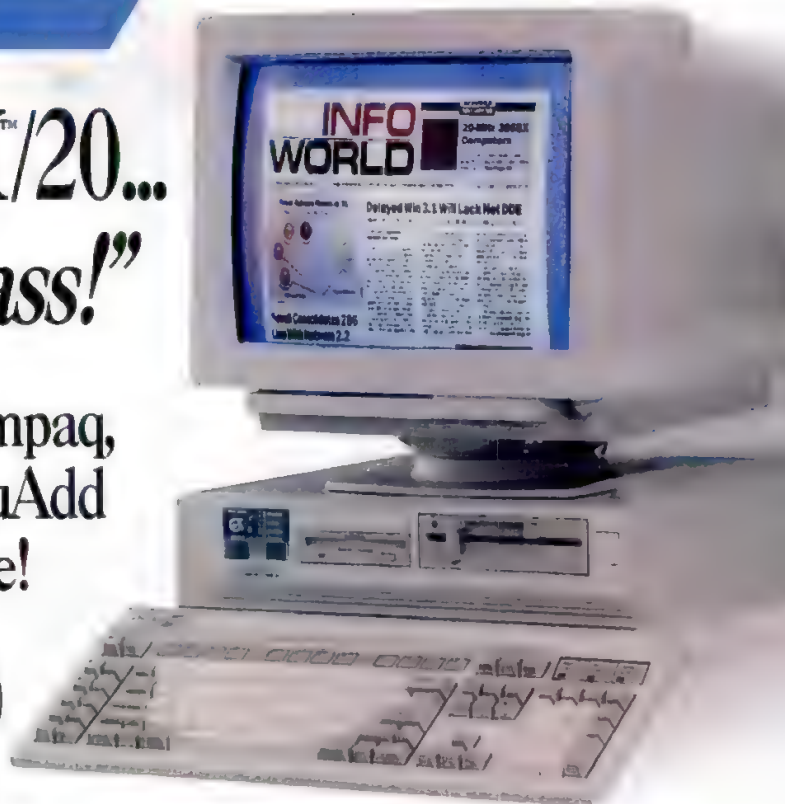
CHANGING FILECTRL COLORS

DEBUG format	Hex value	Color	Description of item
E 109 xx	71	Blue on light gray	Copyright notice and menu
E 10A xx	17	Light gray on blue	Inactive window
E 10B xx	31	Blue on cyan	Highlight bar (active)
E 10C xx	1F	White on blue	Active window
E 10D xx	17	Light gray on blue	Not used
E 10E xx	07	White on black	Highlight bar (inactive)

Figure A: The default values for the various background/foreground color combinations used in FILECTRL are shown in the second column. Using DEBUG, you can enter new values for *xx* at the addresses indicated. A chart of the color values is shown in the text of the sidebar.

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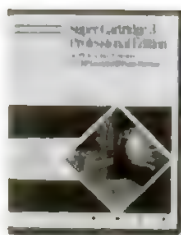
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Contains fully scalable Courier (fixed pitch) for spreadsheets	Super	Yes	No
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Functions with all the LaserJet III's resident fonts	Super	No	Yes
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Utilities

THE SPECIAL INTERRUPT 9 KEYBOARD HANDLER			PARTIAL LISTING
KBD_STATUS	DB	?	;Storage for the scan code.
INT_9	PROC	NEAR	
	PUSH	AX	;Preserve AX.
	IN	AL,PORT_A	;Retrieve the scan code.
	CMP	AL,0E0H	;Is it a special E0h or
	JZ	INT_9_END	
	CMP	AL,0E1H	; E1h?
	JZ	INT_9_END	;If yes, ignore
	MOV	CS:KBD_STATUS,AL	;Else, store the scan code.
INT_9_END:	POP	AX	;Restore AX.
handler.	JMP	DWORD PTR CS:OLD9	;Jmp to the original INT 9
INT_9	ENDP		

Figure 2: An algorithm lets FILECTRL see whether you're holding down an arrow key to scroll files. To do this, the utility uses the interrupt 9 keyboard handler, which detects key-release scan codes.

so successive presses switch back and forth between the two sort orders.

Pressing F7 Name, F8 Extension, F9 Size, or F10 Date changes the sort *field*. By default, FILECTRL sorts by the file-name (as if you had pressed F7), but at any time, you can display the listing sorted by extension, by file size, or by date stamp if you press the corresponding sort function key. Pressing F6 will also reverse the sort direction of the selected field. If you want to change the sort field permanently, see the instructions in the sidebar "Customizing FILECTRL."

The FILECTRL *options* parameter is used for command line switches that set or change many of FILECTRL's default operations. Switches are entered after the *filespec* and are distinguished by being prefaced with a forward slash character (/). What follows is a description of those switches.

When you create or change a file, DOS sets the archive bit in its filename indicating that it has not yet been backed up using the DOS BACKUP command or one of the many commercial utilities. You might feel safer if you remove files that have been safely archived. You can limit FILECTRL's file list to backed-up files by specifying the /M- switch. Contrariwise, by using the /M+ switch you can include just those files that have been modified (in other words, written to) since your last backup.

FILECTRL normally protects you by not listing hidden files. However, you can include hidden files by adding the /H switch.

FILECTRL also omits read-only files from its listing. Normally, you would not want to remove these files; that's why they have a read-only attribute. There are cases, however, when you will want to remove a read-only file. For example, some editors rename the original file to *.BAK, add the read-only attribute, and then save a new file with the changes you have made. You now have a .BAK file that's read-only and a main file that isn't. The *next* time you try to edit the file, you've got trouble: You can't overwrite the read-only .BAK file, so your changes don't get saved. For such situations, you can include read-only files in FILECTRL's listing by specifying the /R switch.

The optional /P mm/dd/yy parameter

includes only files date-stamped on or prior to the date given, and the similar /A switch includes only files marked on or after that date. You can use a hyphen (-) instead of the forward slash in delimiting the date parameter.

WordStar documents call for one additional step. WordStar produces ASCII documents except that it sets the high bit of the last letter of every word. Adding the /W switch if you are using FILECTRL on WordStar documents strips the high bit, making these files more readable.

The remaining *options* switches duplicate choices that could be made with FILECTRL function keys, so no further explanation is needed:

- /N – Sort by name
- /E – Sort by extension
- /S – Sort by size
- /D – Sort by date
- /O – Sort by original DOS order
- /F – Sort in descending order

A summary of the *options* switches appears on-screen each time you exit from FILECTRL.

BATCH FILES

If you wish to use any of the *options* parameters regularly, I suggest you create a batch file that includes your desired switch configuration state. For example, I like to see my directories listed by date in reverse order so that the most recent file appears at the top of the list. The batch file I use looks like this:

```
FILECTRL /D /F %1
```

To make things even easier, just name the

KEYBOARD POLLING ROUTINE			PARTIAL LISTING
GETKEY:	TEST	KBD_STATUS,80H	;Is there a key depressed?
	JNZ	KEY_CLEAR	;If no, clear the KBD buffer.
	CALL	CK_KEY	;Else, is there a key waiting?
	JNZ	GETKEY2	;If yes, go get it.
	JMP	GETKEY	;Else, poll the keyboard again.
KEY_CLEAR:	CALL	CLEAR_KEY	;Clear buffer to stop scrolling.
	MOV	KBD_STATUS,0	;Reset the key-release flag.
	CMP	FILE_CURRENT,TRUE	;Has the highlight bar moved?
	JZ	GETKEY	;If no, poll the keyboard again.
	CALL	DISP_FILE	;Else, time to display the file.
	JMP	GETKEY	;Poll keyboard.
GETKEY2:	XOR	AX,AX	;Retrieve keystroke via BIOS.
	INT	16H	
	XCHG	AX,AL	;Swap scan code and char.
	CMP	AL,ESC_SCAN	;Was Esc pressed?
	STC		;If yes, flag exit FILECTRL.
	JZ	GETKEY_END	
	CLC		;Else, flag not Esc.
GETKEY_END:	RET		

Figure 3: This keyboard polling routine ensures that FILECTRL's highlight bar is positioned on a new filename and that it will remain there, before it tells FILECTRL to display the new file.

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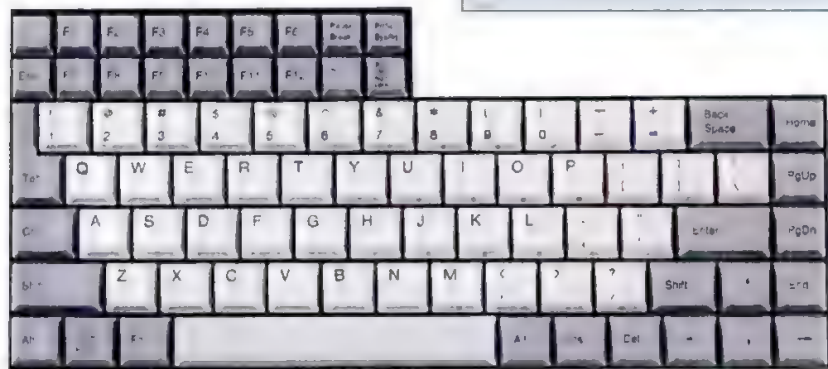
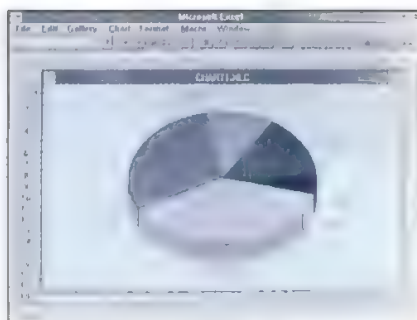
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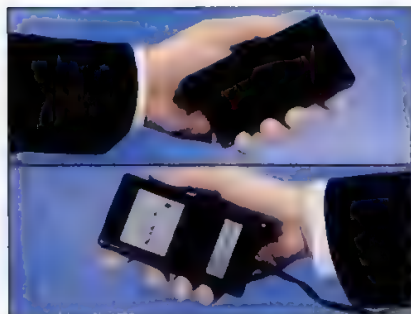
KEYBOARD CAUTION: Before you buy a notebook check out the keyboard. Beware those that have lots of FN key functions. Many systems require using these in conjunction with other keys. They substitute for separate keys.

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- System weight 6.1 lbs with battery; AC adapter 0.8 lb; battery 1.05 lbs.
- 84-key keyboard emulating 101
- 9" diagonal LCD screen; supports 32 shades of gray; VGA 640 x 480
- 386SX/20MHz processor
- 80387SX coprocessor support
- 3MB RAM; expands to 5MB
- 20MB hard drive with auto parking; 40MB and 60MB drive options available
- 1.44MB 3.5" floppy drive
- LED indicators for power on/battery low, charging, caps lock, num lock and hard drive access
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CIRCLE 221 ON READER SERVICE CARD

CODE A01

Utilities

THE STRUCTURE OF THE WORDPERFECT HEADER			PARTIAL LISTING
WP FILE PREFACE STRUC			
WPCorp_FILE_ID	DB	-1, "WPC"	;Signature
START_OF_DOC	DW	7, ?	
PRODUCT_TYPE	DB	1	;WordPerfect
WP_FILE_TYPE	DB	10	;Document
MAJOR_VER	DB	0	
MINOR_VER	DB	0	
ENCRYPTION_KEY	DW	0	;0 = not encrypted
WP_RESERVED	DW	0	
WP_FILE_PREFACE ENDS			

Figure 4: Every *WordPerfect* document must have a 16-byte header file that contains the identifying signature and a pointer to the start of the text. The structure of the header is shown above.

batch file F.BAT. Then, for example, you need only enter

P PCMAG

and the %1 in the batch file will be replaced by the *filespec* you enter on the command line—PCMAG in this example.

PROGRAMMING NOTES

Programmers who have looked at the code of some of my previous file- and directory-handling utilities will find most of the techniques embodied in FILECTRL.ASM familiar. Two points may be of interest, however: the special interrupt handler used in FILECTRL, and the treatment of the *WordPerfect*, *Word*, and *Q&A* word processing formats.

Every time you move the listing highlight bar to a new filename, FILECTRL opens the new file, determines the file type (*WordPerfect*, *Word*, *Q&A*, or ASCII) and then displays the file. FILECTRL reads in only 4K of the file initially. This minimizes disk access time, so the file can appear almost instantly. More of the file is read as needed if you activate the file window and scroll through the file.

Although today's disks are incredibly fast compared with those of years past, the disk access is still the slowest part of computing. If you held down an arrow key (thus activating the typematic keyboard feature) to scroll up or down the file list and if FILECTRL had to display each and every file as the highlight bar passed over it, the disk access times would accumulate and bring the scroll bar to a crawl.

To keep from slowing the highlight bar, FILECTRL uses a special algorithm that detects whether you are holding down an arrow key and displays a file only after the key is released and the highlight bar comes

to rest. To do this, FILECTRL installs the special interrupt 9 keyboard handler shown in Figure 2.

While TSRs hook interrupt 9 to watch

FILECTRL at first reads in only 4K of a file, minimizing disk access time, so the file appears nearly at once.

for the make scan code of their hotkey, FILECTRL grabs it to look for a key-

release scan code. A key-release scan code is the same as the key-press scan code except the high bit is set. For example, the scan code generated when the A key is pressed is 1Eh (00011110b); when it is released 9Eh (10011110b) is generated. It's easy to detect a key release, therefore, by testing if the high bit of the scan code is set.

At least that was true with the 83-key keyboard. With keys added in the 101-key keyboard came also two additional scan codes that are inserted between a key make and a key break to distinguish the dedicated arrow keys from those on the key pad. These two scan codes are 0E0h and 0E1h, or 11100000 and 11100001 in binary. These two values, of course, *also* have the high bit set, so special testing now must be included to avoid confusing the 0E0h and 0E1h scan codes with key breaks. In short, however, the FILECTRL interrupt handler stores every scan code that comes its way except for 0E0h and 0E1h.

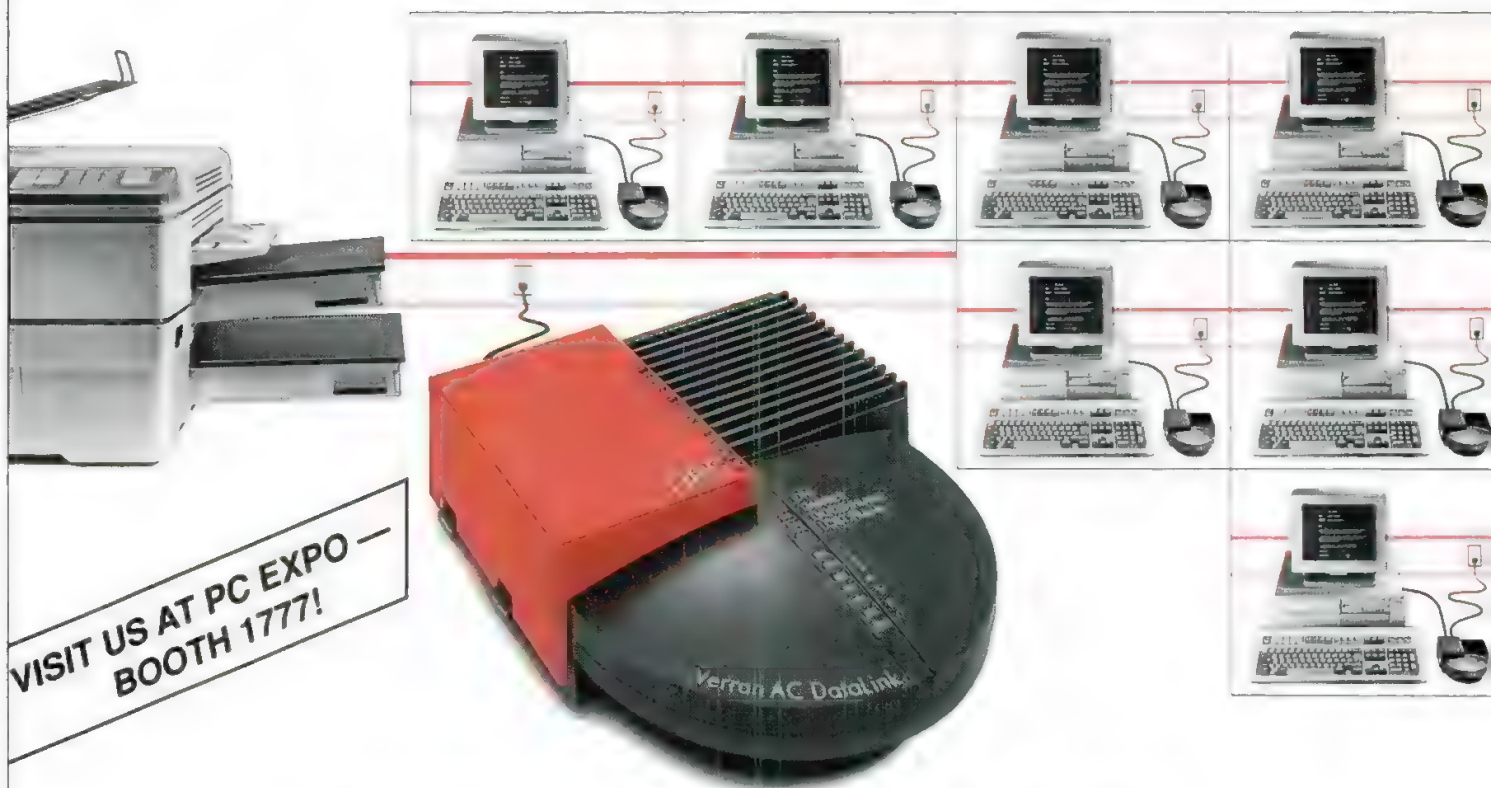
It's the job of FILECTRL's keyboard-polling routine, shown in Figure 3, to decide when to display a new file. The polling routine looks for two situations: (1) The highlight bar has moved to a new filename and (2) it is not about to move off to yet another new filename. The listing display routine (not shown) takes care of noting when the highlight bar has changed positions by changing the variable CURRENT_FILE from TRUE to FALSE. If it is FALSE, then the keyboard polling knows the highlight bar has moved. Then if KBD_STATUS has a scan code of a key break, it knows no keys are depressed and can assume the highlight bar has come to rest. This is the cue to display the new file.

WORDPERFECT CODES	
	CONTROL CHARACTERS (01h-1Fh)
	These are 1-byte codes, mostly of the merge type. Included in this set is character 10, a hard carriage return, and 13, a soft carriage return.
	SINGLE-BYTE FUNCTIONS (80h-8Fh)
	Examples are justification, block on and off, and hyphenation
	MULTIBYTE FUNCTIONS (C0h-FFh)
	All multibyte codes begin and end with the same code.
	Fixed-length multibyte functions (C0h-CFh)
	For example, extended characters, text alignment, and indent.
	Variable-length multibyte functions (D0h-FFh)
	The variable functions are divided into groups, each of which has several subfunctions. Group examples are font, definition, set, format, header/footer, footnote/endnote, generate, display, and miscellaneous.

Figure 5: Listing the meanings of each of the *WordPerfect* reveal codes individually is impossible, for reasons of space. Instead, the above is a summary of the different types of codes.

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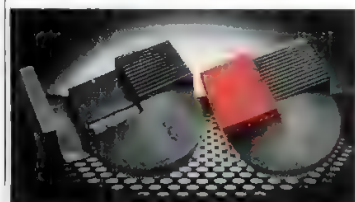
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HOW FILECTRL SEPARATES WORDPERFECT CODES FROM TEXT

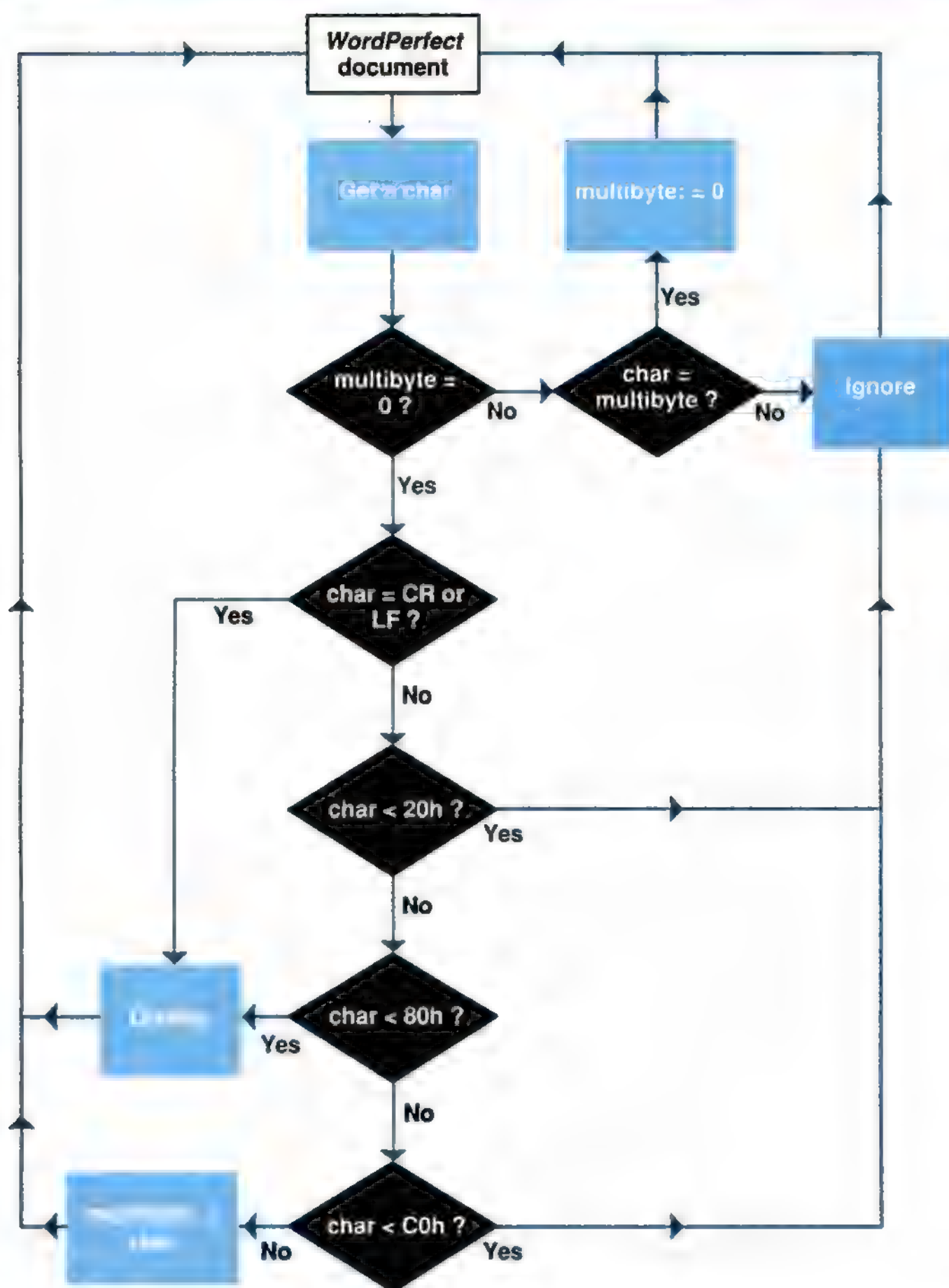


Figure 6: This flowchart was used in programming FILECTRL to determine which characters within the text area were formatting codes and which should be displayed.

Thus the user gets a highly responsive highlight bar, and when he stops on a file-name, the file appears instantly.

WORD PROCESSOR FORMATS

Almost all word processor document files begin with a binary header that contains general information pertinent to that word processor. The format of this header is pro-

prietary, however, as are the codes that set attributes such as italics or boldface. The formatting information (or codes) can be found either in packets right after the header, sprinkled among the text, or in packets after the text—or in some combination of these. The nearest you get to a uniform policy is that most word processors place a distinctive signature at the very beginning

of the file so that they can identify a file as being one of their own!

The differences between formats is, of course, the reason you can't read a *WordPerfect* document into *Microsoft Word* or a *Q&A* document into *WordPerfect* or any other cross combination without first converting the file to the other's format.

You can get a copy of the complete document spec from the individual software companies. Each spec encompasses many pages and so is beyond the scope of this article. Although the descriptions of the *WordPerfect*, *Word*, and *Q&A* formats given below are thus far from complete, they *do* contain all the information a programmer needs—and FILECTRL uses—to find the text of a document.

FILECTRL's goal was not to interpret all of each word processor's format information. Rather, it was simply to display the *text*. This turned out to be much simpler than I had originally anticipated. The document header information in *WordPerfect* and *Q&A* documents contains pointers to the start of the text, and the text in *Word* documents is always 128 bytes from the start of the file. And once you find the text, it's just a matter of ignoring any codes mixed in with the text.

WORDPERFECT

A *WordPerfect* document consists of the following, in order:

- (1) A 16-byte file header that contains the identifying signature and a pointer to the start of the text. The structure of this header is shown in Figure 4.
- (2) An additional prefix area organized in index blocks and data packets. Each index block contains a number of indexes that point to data packets. The data packets include information about the initial setup codes, setup codes when last saved, list of fonts, default printer, and so on.
- (3) The document area contains the text, which is interspersed with formatting information.

The first 4 bytes of a *WordPerfect* document hold the signature FFh, "WPC". Right after this is a double-word pointer to the start of the text. The next 2 bytes indicate the product and file types. The product type should be 1 for *WordPerfect* and the file type 10 for document.

The text extends to the end of the file. Formatting information is contained within the text in what are known as *codes*. If you're familiar with *WordPerfect*, you know that pressing Alt-F3 from within *WordPerfect* displays the meaning of any

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THE STRUCTURE OF THE HEADER IN MICROSOFT WORD				PARTIAL LISTING
WORD_FILE_INFORMATION_BLOCK				STRUC
wIdent	DW	0BE31H		;Signature
dtyDW	DW	8		;Document type
wTool	DW	0AB00H		;Signature
pnNextFib	DW	?		;Pointer to incremental save
pnChar	DW	?		;Pointer to Char formatting
pnPlcpd	DW	?		;Pointer to piece table
wReserved2	DW	?		;Paragraph height table
fcMac	DW	?, ?		;File char pos of file end
pnPara	DW	?		;Location of para formatting
pnFntb	DW	?		;Location of footnote table
pnBkmk	DW	?		;Bookmarks and sequence info
pnSetb	DW	?		;Section table
pnBftb	DW	?		;Buffer table
pnSumd	DW	?		;Summary information
szSsh	DB	66 DUP(?)		;Style sheet path
wReserve	DW	?		;For Windows Write use
rgchPrtNm	DB	8 DUP(?)		;Printer name
pnMac	DW	?		;One past end of document
DOP	DB	8 DUP(?)		;Document properties
version	DB	?		;word version
fAsv	DB	?		;Autosave
pnPagb	DW	?		;Word 5.0 page table
pnMacBkmk	DW	?		;Mac of Bkmk stuff
pnFilename	DW	?		;Only used for Asv files
pnRhtb	DW	?		;Running head table
codepage	DW	?		;codepage
WORD_FILE_INFORMATION_BLOCK				ENDS

Figure 7: This 128-byte header file for Microsoft Word documents contains an identifying signature and a pointer to the end of text. The text always begins after this file, at byte 128.

codes found in your document.

The codes comprise both single-byte codes and multibyte codes, the main types are shown in Figure 5. Multibyte codes are further broken into two subgroups of fixed-length and variable-length codes. Multibyte codes, both fixed and variable, begin and end with the same code. It's easy for a program to ignore a multibyte code: Just look for a matching ending code and ignore everything in between.

WordPerfect documents are the most complicated of the three word processor formats discussed here. Displaying such a document, however, isn't terribly difficult. After identifying the file as a WordPerfect document from the signature, start reading text at the offset pointed to by START_OF_DOC. Then, either display or ignore the character according to the flowchart shown in Figure 6. The flowchart was used to program the WordPerfect file display routine in FILECTRL.COM.

As each character of the document is examined, the algorithm checks to see whether it falls into the ASCII character set that WordPerfect supports or whether it is a code character instead. If a multibyte start code is encountered, it is stored in a variable called MULTL_BYTE. Subsequent characters are ignored until an ending code matches the one stored in MULTL_BYTE.

MICROSOFT WORD

Microsoft Word uses the same basic format for its document files, glossary files, stylesheet, and autosave files. This format has been used for all versions of Word, from 1.0 to 5.0. Thus, any version can read the files of all other versions, including those of Word for Windows.

A Word document consists of the following, in order:

- (1) A 128-byte file header that contains (among other things) the identifying signature and a pointer to the end of the text. The start of the text is at byte 128, immediately after the header. The header structure is shown in Figure 7.
- (2) The text of the document, which is straight ASCII text supplemented with the IBM extended character set. Some of the low order codes (those under 32, the space character) are used for functions such as forced line-feeds and page breaks. Apart from these, there are no formatting codes in the body of the text. The formatting comes after the text.
- (3) Text-formatting information is placed after the text and is organized in 128-byte structures called pages.

The first 6 bytes of a Word document file contain the 3-word sequence BE31h, 0000h, AB00h. The middle word (0000h) identifies the file as a document. The other

2 nonzero words are the signature. The double word at offset 14, fcMac, is the pointer to the end of the text section.

Except for two codes, embedded text formatting is limited to the ASCII characters 0 through 31 (those below the space). The two exceptions are characters 196 (nonbreaking hyphen) and 255 (a nonbreaking space). Word's special codes are listed in Figure 8.

The format of a Word file makes displaying its text very easy. After identifying it by its signature, you start displaying the text starting at offset 128 and simply continue to the end of text, which is pointed to by fcMac. Ignore all characters below space (32 decimal) except for carriage return (13) and line-feed (10), of course. You could add code to look for the special characters 196 and 255, but since these appear so infrequently, it's hardly worth the effort.

Q&A

Q&A is an integrated word processor and flat-file database that was initially released by Symantec in October 1985. In July of 1987, the word processor portion became available separately as Q&A Write.

A Q&A document consists of the following, in order:

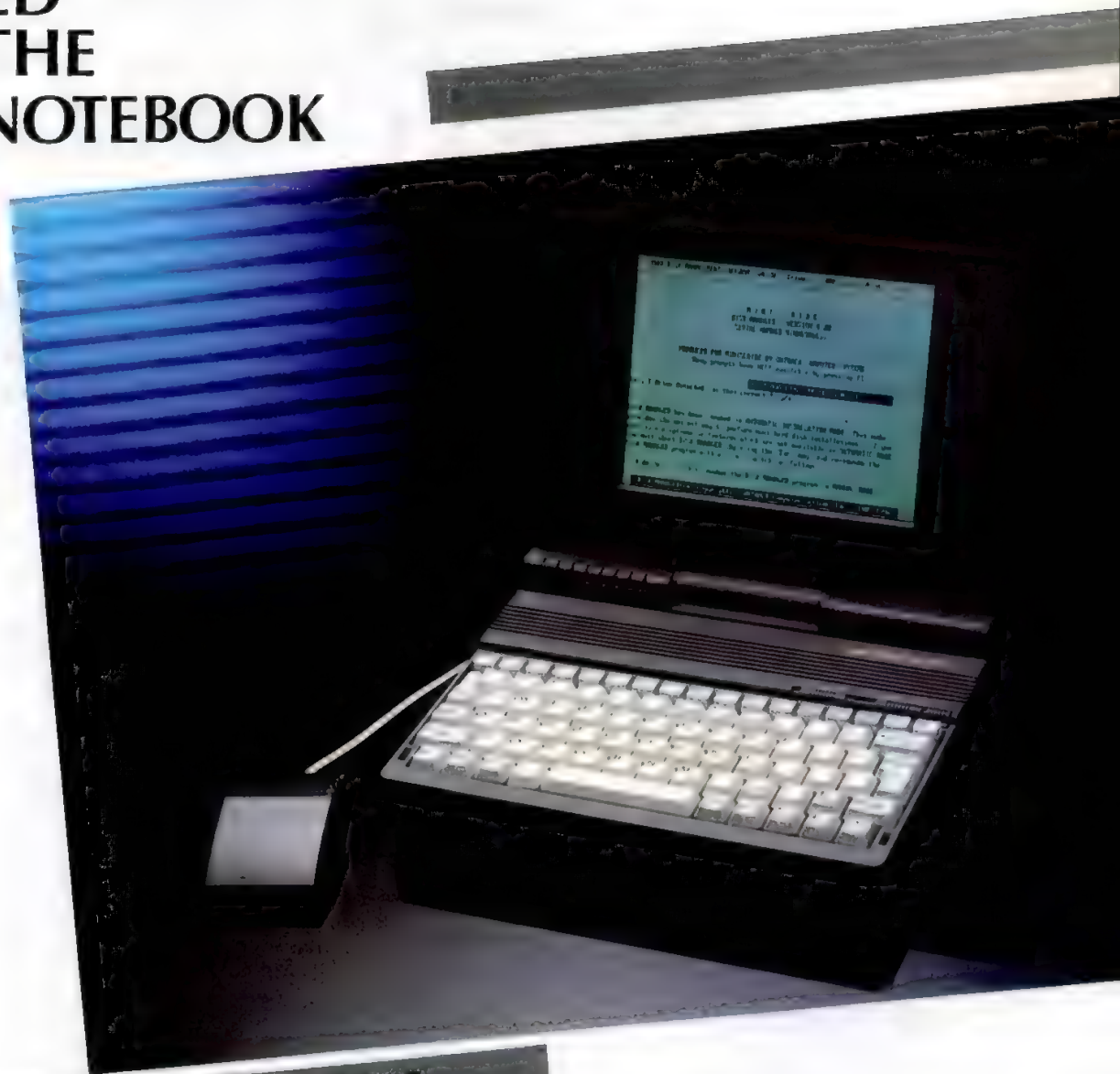
- (1) A 38-byte file header that contains (among other things) the identifying signa-

ASCII CODES WITH SPECIAL MEANINGS IN WORD	
Character	Meaning
1	Print current page
2	Print current date
3	Print current time
4	Autonumbered annotation reference
5	Autonumbered annotation reference
7	Sequence mark
8	Sequence reference mark
9	Tab
10	Line-feed
11	Hard line break
12	Form-feed
13	Carriage return
14	Hard column break
15	Em-dash
31	Unrequired hyphen
196	Nonbreaking hyphen
255	Nonbreaking space

Figure 8: With only two exceptions (ASCII 196 and 255), Word applies special meanings only to low-order ASCII codes.

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PC MAGAZINE UTILITIES UPDATES

Like all good software, the programs presented in *PC Magazine* are upgraded and improved. You can get the modified versions by downloading them from PC MagNet. Here's a partial list of the programs that have been upgraded to fix minor bugs and system incompatibilities:

ALIAS.COM, Version 1.1
ANSI.COM, Version 1.3
BAT2EXEC.COM, Version 1.3
BCOPY, Version 1.2
BEN56.ARC (Benchmark Series, Version 5.6)
CARDFILE.COM, Version 1.1
CHKFRAG.EXE, Version 1.2
CMDEDIT.EXE, Version 2.1
CONFIG.CTL, Version 3.0
CONVERT.COM, Version 1.1
DIRMATCH.COM, Version 2.0
EMMA.COM, Version 2.2
EMS40.SYS, Version 1.1
LASERLIST.COM, Version 1.1
LITES.COM, Version 1.1
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MONO.COM, Version 1.1
MOUSE.CTL, Version 1.1
PANDORA.COM, Version 1.5a
PCACCESS.COM, Version 1.1
PCMANAGE.EXE, Version 1.1
PCREMOTE.COM, Version 1.1
RN.COM, Version 2.0
SCHEDULE.COM, Version 1.1
SLICE.COM, Version 1.3
SNIPPER.COM, Version 1.2
TPFST-AT.COM, Version 1.1
ZCOPY.COM, Version 1.2

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CATALOG INFORMATION

Need to find the latest files? The Software and Utility Library (GO SOFTLIB) provides three catalogs, complete with filenames, locations, and brief descriptions of each listing:

Photocopy this page. Trim and hole-punch the copy and add it to your manual.



Michael J. Mefford

FILECTRL Command

July 1991 (Utilities)

Purpose:

A full-directory file-viewing and -removal utility capable of displaying *WordPerfect*, *Microsoft Word*, *Q&A Write*, and *WordStar* documents as if they were in ASCII format. FILECTRL automatically supports normal 25-line, 43-line (EGA), 50-line (VGA), and *UltraVision* displays.

Format:

FILECTRL [filespec] [options]

Remarks:

Entered without any parameters, FILECTRL displays a filename list of the current directory in its left window and the first part of the text of the highlighted filename in its right window. The text is shown stripped of any header and formatting codes. Any drive and/or directory can be specified with *filespec*, and * and ? can be used to limit the file list. Pressing Esc exits the utility.

The Tab key (a toggle) shifts between windows, as do the Left and Right Arrow keys. The display in the active window is shown in high-intensity color, and scrolling within the active window uses the usual Up and Down Arrow, PgUp and PgDn, and Home and End keys. In the file list window, pressing a letter jumps the selection highlight to the first filename beginning with that letter.

F2 deletes a highlighted filename or empty subdirectory, and Ctrl-F2 deletes a group of marked filenames. Files can be marked with the Plus key and unmarked with the Minus key; the Spacebar toggles the mark on and off. All deletions are prompted for confirmation prior to execution.

Pressing F5 successively (1) widens the file list to show full DOS directory information, (2) widens the text display to a full 80 columns, and (3) returns to the original display. Shift-F5 reverses the display sequence. Pressing Enter while a filename is highlighted toggles between the file list display and the 80-column text display. Pressing Enter while a subdirectory (< >) or the parent (<..>) directory is highlighted loads the files from that directory. F3 permits entering a new *filespec*.

By default, FILECTRL sorts filenames in ascending alphabetical order. The F7, F8, F9, and F10 keys set the sort field to filename, extension, size, and date, respectively. Pressing F6 toggles between ascending and descending order.

FILECTRL also permits entering a number of *options* as command line switches. These are summarized below:

```

/M +      Include only files modified since
           last backup
/M -      Include only files not modified
           since last backup
/H        Include Hidden files
/R        Include Read-only files
/P date   Only include files ON or Prior
           date
/A date   Only include files ON or After
           date
           date    format: mm/dd/yy
/W        WordStar files; remove high bit
/N        Sort by Name
/E        Sort by Extension
/S        Sort by Size
/D        Sort by Date
/O        Sort by Original DOS DIR order
           default: Sort by Name
/F        Sort in descending order
  
```

For use with laptop computers, it may be necessary to enter the DOS MODE BW80 command before executing FILE CTRL. Instructions on modifying FILECTRL.COM with DEBUG to use alternative colors, to disable its border, and to change its default sorting options are contained in a sidebar to the original article.

ENDS

JOURNAL BY MODEM

PCMCAT.ZIP—a complete list of all *PC Magazine* utilities and related files, including source code and documentation. Among some of the favorites you'll find: PRUNE.COM, PRISM.EXE, DR.COM, TED.COM, PCBOOK.EXE, the archived collections of HP LaserJet utilities (HPLSJT.ZIP), and file manager utilities (FILMAN.ZIP).

UPDATE.ZIP—a complete list of all the programs that have been updated since their release.

SHWCAT.ZIP—a catalog of the high-quality freeware and shareware, including those mentioned in earlier issues. Some of these valuable tools are PKZIP (PKZ110.EXE) and ARCE (ARCE.EXE), for archiving and extracting files; VDE, a text editor (VDE.ZIP), *AsEasyAs*, a spreadsheet (ASEASY.ZIP); and *Windows* icons (MGICON.ZIP).

All catalogs may be easily printed with two *PC Magazine* HP LaserJet utilities: PCBOOK lets you create your own booklet, and LASERLST lets you print two pages on one piece of paper. If you prefer not to use paper at all, browse the catalogs with BROWSE.COM or WINSMOOTH (WSMOOT.ZIP).

A downloadable index to *PC Magazine's* product reviews is also available. PCM.EXE is a self-extracting file containing the *Computer Library PC Magazine Reviews Index* for January 1988 to December 1990. It requires the search files in PCSRCH.EXE. Please read the information file PCM.INF before you download any of these files.

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How to be a heavy hitter without being a heavy lifter.

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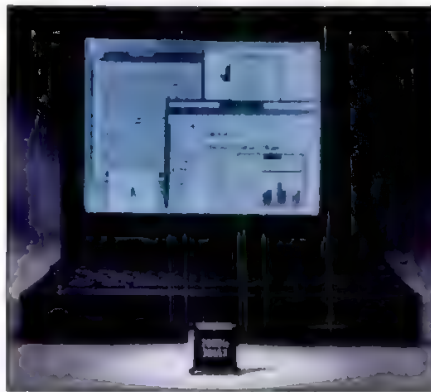
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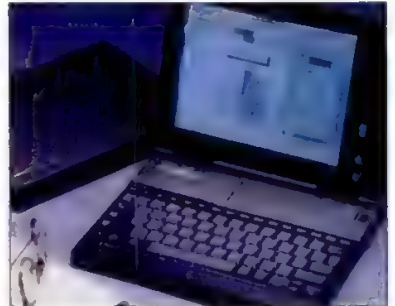
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**TEXAS
INSTRUMENTS**

THE STRUCTURE OF THE Q&A HEADER			PARTIAL LISTING
QandA_HDR	STRUC		
sig	DB	"TBWP",0	;Touchbase signature
QandA_date	DB	13 DUP (?)	;Date file last updated
QandA_time	DB	9 DUP (?)	;Time file last updated
reltxtloc	DW	?,?	;File rel loc of start of text
txtsize	DW	?,?	;Size of the text
ver	DW	?	;Version number
ehdr	DB	?	;End of file header
QandA_HDR	ENDS		
;Q&A files have for the signature either			
; TBWP (TouchBase Word Processing file) or			
; TBTX (TouchBase Text file).			
sig2	DB	"TBTX",0	

Figure 9: This is the header file for Q&A. The first 5 bytes of this structure contain the identifying signature, which is either TBWP or TBTX followed by a null (0).

ture, a pointer to the start of the text, and the size of the text.

(2) An array of 11-byte line headers, one header for every line of text. The information in the line headers points to the beginning of every line and is used to speed the document display. Without pointers to the line starts, *Write* would have to word-wrap the text to the screen on the fly, which would slow its scroll response time. (From its Display Setup menu, accessed by Shift-F1 Setup, *WordPerfect* gives you the option of on-the-fly text formatting with slower response time or of formatting only

when you scroll to a new line for faster response, for example.)

(3) The document text. Headers and footers are stored in structures before the text of the document and are ignored by FILECTRL.

(4) Information about screen display (cursor position, tab positions, and so on) and printing (margins, page length font).

The 38-byte Q&A header is shown in Figure 9. The first 5 bytes contain the identifying signature, which is either TBWP or TBTX followed by a null (0). *TouchBase* was the original internal name Symantec used for the Q&A product. TBWP stands for TouchBase Word Processing file, and TBTX stands for TouchBase TeXt file. TBTX files contain only text, and TBWP files contain headers or footers and screen and printing information as well as text.

Text formatting is "sprinkled" within the text. *Write* supports all characters from 1 to 254. Character 0 isn't used, and character 255 is used to initiate embedded control sequences for text formatting. Since 255 is FF in hex, the control sequences are known as FF codes. There are two groups of FF-code sequences: 2-byte and 4-byte. The byte that comes immediately after 255 is called the *attribute*. If the attribute is anywhere from 32 to 63, a 4-byte FF code is involved; otherwise it's a 2-byte FF code.

The attribute is also the code for the type of text formatting, as shown in Figure 10. For example, 1 is the code for carriage return. Since 1 is outside of 32 to 63, it is a 2-byte FF code, and so will appear as FF followed by 1 in the text. The attribute for left indent is 33 (21h), which is a 4-byte at-

tribute. A left-indent FF sequence in hex would be FF 21 xx yy, where xx is the indent that will take effect on subsequent lines and yy is the current line's indent.

To display a Q&A document's text, you first identify it by the header signature, which comprises the first 5 bytes of the file. You then find the start of the text from the double word pointer reltxtloc in the file header. The length of the text is the next double word pointer, txtsize.

Your next move is to display all of the text as text except for the FF codes. You can safely ignore those except for code 1—which is a hard carriage return—and still maintain a readable display.

There's an interesting sidelight about Q&A files. If you've ever looked at a Q&A file with an ASCII viewer (or just TYPED

With FILECTRL, you
no longer have an
excuse to keep putting
off the task of culling
out unneeded
documents.

one to the screen), you will have noticed the string "Q&A Write—B. Emerald". B. Emerald is the pseudonym of Barry Greenstein, the author of *Q&A Write*. Greenstein means "green stone"—or *emerald* in English. When a document is in memory, there is always a gap between the last line header and the start of the text. This allows for document growth. When the document is saved to disk, this space is filled with Barry's pseudonym.

FILECTRL was designed so you would no longer have an excuse to keep putting off the task of culling out unneeded documents. But as you will have realized, it's not necessary to delete any files while you use FILECTRL. I won't tell anyone if you rename FILECTRL to VIEWER and use it as your primary file viewer. You can then regard its weeding capabilities as a bonus to be used only occasionally. That's what I've done. ■

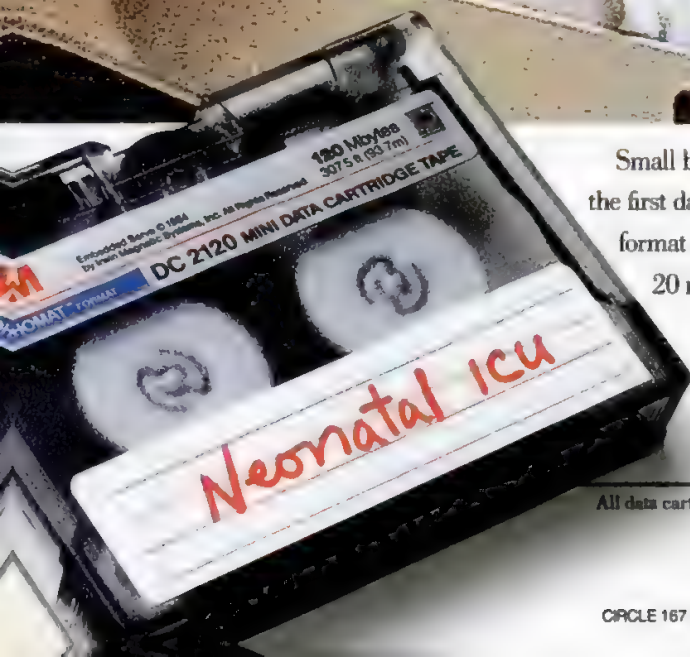
Michael J. Mefford is a contributing editor of PC Magazine.

Q&A FORMATTING CODES	
Attribute byte	Meaning
1	Hard carriage return
4	Soft hyphen
32	Conditional page
33	Left indent
34	Right indent
35	Microspaces
64	Forced pagebreak
65	Centered line
66	Right-justified line
128	Bold on
129	Underline on
130	Marked on
131	Superscript on
132	Subscript on
133	Italics on
134	Strikeover on
136-143	Font 1 on through Font 8 on
144-159	Turn off enhancement whose attribute byte is 16 less

Figure 10: The FF codes used by Q&A Write.



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PC MagNet News

The Latest Files and Features of PC Magazine's On-line Service

VDE Editor Improves

A new version of the VDE shareware word processor has recently been released by author Eric Meyer. You may recall John C. Dvorak's praise of this small but powerful editor in his Inside Track column over a year ago (April 24, 1990). Well, Meyer has improved this package, and Version 1.61 should elicit just as extensive an accolade.

This multifaceted editor applies WordStar commands to an extremely quick and highly intricate piece of writing software. High-performance features such as auto-formatting, auto-save, windowing, function keys, and macro capability all comple-

ment its WordPerfect and WordStar compatibility. New features in Version 1.61 include an envelope-printing option, screen-size adjustment, easier block marking, and smoother file browsing. VDE's adaptability allows all the important word-processing features you need to reside within a small editor (only 54K), while the formatting and printing features make it productive. VDE is perfect for laptops, and its ASCII mode makes it an ideal choice both as a standalone file editor and one that runs from a shell of another application.

Available as shareware (\$30), Version 1.61 and its complete documentation are filed as VDE161.ZIP and is located in DL15, The Working Word, of UtilForum (GO UTILFORUM).

PC MagNet's Bruce Biermann

PC MagNet's Utilities/Tips Forum (GO UTILFORUM) is one of the quick and easy ways to get hundreds of new files, applications, and programs, as well as the support and guidance to make the most of these programs. And people familiar with the Utilities/Tips Forum on PC MagNet are probably aware of the hard work and genuine accessibility of assistant sys-op Bruce Biermann.

Biermann has an extensive background in finance and accounting and owns several small businesses, his enthusiasm lies in his involvement with personal computers. His CompuServe story goes like this: "I started by lurking on the IBMNET and AVSIG forums, but was

drawn to the PC MagNet forums from the day they began. The opportunity to discuss industry issues with Bill Machrone, Will Zachmann, John Dvorak, Neil Rubenking, and Barry Simon is invaluable and fun." On a daily basis, Bruce monitors over 30 forums. He claims his own foolishness kept him from using a navigation program when he first joined CompuServe (he now uses one). This may explain why he is adamant about encouraging new users of PC MagNet to use TAPCIS, AutoSig, CISOP, or another automated navigation program.

Bruce and his wife live in the foothills between Lake Tahoe and Sacramento, but Bruce still considers Seattle home. So be sure to say hello to Bruce, he'll be hard at work on UtilForum.

—Chris Parker

- **TEXT EDITOR:** Version 1.61 is the latest installment of the respected VDE shareware word processor.
- **SYSOP PROFILE:** Bruce Biermann can always be found hard at work in PC MagNet's Utilities/Tips Forum.

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CIRCLE 179 ON READER SERVICE CARD



by
Charles Petzold

Environments

You can use bitmaps in many different ways in a *Windows* program. For many chores involving bitmaps, you can use either the old bitmap functions (supported in versions of *Windows* beginning with 1.0) or the new device-independent bitmap (DIB) functions, some of which I described in the last issue.

My basic rule is this: Use the simplest available function that does the job. For example, suppose you want to write a routine that captures all or part of the *Windows* screen image to a bitmap. This bitmap should be compatible with the color organization of the video display. The easiest function that creates such a bitmap is `CreateCompatibleBitmap`. You then call `CreateCompatibleDC` to create a memory device context, `SelectObject` to select the bitmap into the memory device context, `CreateDC` with a first parameter of `DISPLAY` to get a device context for the screen, and `BitBlt` to copy from the video device context to the memory device context. Call `DeleteDC` twice to delete both device contexts, and you're left with the bitmap.

Another common task is creating a "shadow bitmap," which contains the same visual information as your window. Having this bitmap helps to refresh the window as quickly as possible. Again, this bitmap should be compatible with the video display, so you can use `CreateCompatibleBitmap`.

WHERE BITMAPS DON'T HELP

Then there are those chores for which you shouldn't be using *Windows* bitmap functions at all!

Let's suppose you want to write a *Windows* program that converts among various bitmap file formats, such as the *Windows* device-independent bitmap (with the extension .BMP), *PC Paintbrush* (.PCX), and the CompuServe Graphics Interchange Format (.GIF). You might consider using the GDI bitmap object as an intermediary format. To do this, you write routines to read in each type of format and create a

Preserving a Device-Independent Bitmap: The Packed-DIB Format

■ GDI doesn't retain device-independent bitmap data. You have to do that yourself, and the packed-DIB memory format provides a convenient method.

bitmap object from the file using `CreateDIBitmap` and `SetDIBits`. Then, you could also have routines to use `GetDIBits` on the bitmap object and write out the bitmap in each format.

Don't do it! As I demonstrated in the last issue, `CreateDIBitmap` converts device-independent bitmap information into a device-specific bitmap object, and the device-independent information is thrown away. For example, suppose your program is running on a 16-color VGA and reads in a 64-gray-shade .GIF file. The bitmap you create and initialize using `CreateDIBitmap` and `SetDIBits` will have only 16 colors, and only 4 of them will be gray shades.

Similarly, if you're using a *Windows* program to read bitmapped data from a scanner or a video frame grabber to save as files, you're probably dealing with 64 or 256 gray shades, or 18-bit or 24-bit color information. If you use this data with `CreateDIBitmap` and `SetDIBits` to create a bitmap, it will be compatible with the screen and very likely will lose this gray shade or color information.

This means you should avoid creating

a bitmap object. Don't let GDI convert the data to a device-specific format. Instead, you can simply store the bitmap data (including information about the size of the bitmap and its color table) in application memory in a data block allocated using `GlobalAlloc`.

So now the question becomes, What's a good format to use to store this bitmap data? Well, considering that you're writing a *Windows* program, the best solution is a format implied by the *Windows* API. After searching around for awhile, you might find a good suggestion in an unusual place—the documentation on the *Windows* clipboard.

THE CLIPBOARD AND BITMAPS

Since *Windows* 1.0, programs have been able to transfer bitmaps through the clipboard fairly easily. To put a bitmap into the clipboard, you pass the bitmap handle to `SetClipboardData`. To get a bitmap out of the clipboard, `GetClipboardData` will return the bitmap handle. Generally, these bitmaps will be either monochrome or compatible with the video display.

However, it would also be nice to transfer a device-independent bitmap specification through the clipboard. This can't be a bitmap handle, because bitmap handles always refer to GDI bitmap objects, and bitmap objects are always monochrome or specific to some real device.

Instead, the documentation for `SetClipboardData` describes another approach for passing DIBs through the clipboard. You use a global memory block (referenced by a global handle) that contains a `BITMAPINFOHEADER` (or `BITMAP-`

Environments

COREHEADER) structure, followed by an array of RGBQUAD (or RGBTRIPLE) structures for the color table (unless you're dealing with a 24-bit color bitmap) followed by the bitmap bits. This is sometimes called the *packed-DIB* memory format, and this is the format I suggest you use when you need to preserve device-independent bitmap data in your *Windows* programs.

THE PACKED-DIB FORMAT

Once you start using the packed-DIB format, reading and writing DIB files becomes very easy, because the packed-DIB format is simply a memory image of a DIB file without the initial BITMAPFILEHEADER structure.

To read a DIB file into a packed-DIB memory format, you first read in the BITMAPFILEHEADER structure. The second field of this structure is the total size of the file. You use GlobalAlloc to allocate a global memory block this size less the size of the BITMAPFILEHEADER structure. You then lock the memory and read the rest of the file into this memory block. (Of course, you may also want to perform certain consistency checks on the data to assure yourself that you're dealing with a valid DIB file.)

To write a DIB file from a packed-DIB memory format, you first write out a BITMAPFILEHEADER structure. The second field is the size of the memory block (which you can obtain from the GlobalSize function) plus the size of the BITMAPFILEHEADER structure. Then you write out the packed-DIB memory block to the file.

For large bitmaps, this global memory block can be well over 64K. For example, a bitmap containing an entire screen image of the 1,024-by-768-pixel 256-color 8514/A is over 768K. This may seem like a lot of data for your program to carry around, but if you were to let GDI store this bitmap for you by creating a bitmap object from the data, it would be about the same size. And consider a 16-color bitmap stored as a GDI bitmap object on a 256-color display—the packed-DIB memory block is half the size of the device-specific bitmap object. The bitmap data in the packed-DIB memory block can also be compressed, while the data in a GDI bitmap object is never compressed.

USING PACKED-DIB IN DIB FUNCTIONS

Besides the ease in reading and writing DIB files, it's also fairly easy to create a bitmap object from the packed-DIB memory block using CreateDIBitmap. To do this, all you really need to know is the address of the bitmap bits within the packed-DIB memory block.

The DibDataAddress function in Figure 1 shows how to find this address. You simply pass the address of a packed-DIB memory block and the function returns the address of the bitmap bits. DibDataAddress first obtains the double word from the beginning of the packed-DIB memory block. This is the size of the BITMAPINFOHEADER or BITMAPCOREHEADER structure. If this size is 12, then the DIB is compatible with OS/2 1.1. In that case, the size of the color table is either 0 (for a 24-bit color bitmap) or based on the size of the RGBTRIPLE structure and the number of colors.

For a *Windows* 3.0 DIB, the size of the

Besides the ease in reading and writing device-independent bitmap (DIB) files, it's also fairly easy to create a bitmap object from the packed-DIB memory block using CreateDIBitmap.

color table could be in the biClrUsed field of the BITMAPINFOHEADER structure. If the structure is not large enough to encompass this field, or if this value is 0, then the size of the color table is based on the size of the RGBQUAD structure and the number of colors.

The address of the bitmap bits is simply the address of the DIB memory block plus the size of the information structure plus the size of the color table.

Suppose that pDib is a far pointer to a packed-DIB memory block. To create a device-specific bitmap object from this memory block, call the CreateDIBitmap

function in the following way:

```
hBitmap = CreateDIBitmap (hdc,
    (LPBITMAPINFOHEADER) pDib,
    CBM_INIT, DibDataAddress (pDib),
    (LPBITMAPINFO) pDib,
    DIB_RGB_COLORS) ;
```

Don't worry about DIB blocks greater than 64K or passing a huge data pointer to CreateDIBitmap. The function can handle them.

DISPLAYING DIBS DIRECTLY

Here's the normal way to display a bitmap on a program's window: Create a memory device context compatible with the video display. Select the bitmap handle into the memory device context using SelectObject, then call BitBlt or StretchBlt to copy from the memory device context to the window device context.

If you're storing bitmaps in the packed-DIB format, however, this is a bit of a problem. You first have to create a bitmap object from the packed-DIB data. Now your bitmap may be taking up twice as much memory space as before, because it's stored both in application memory and in GDI memory.

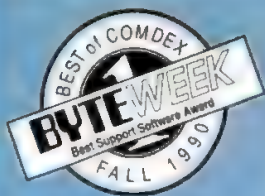
As an alternative, you can display the DIB specification directly, using SetDIBitsToDevice or the more-generalized StretchDIBits. SetDIBitsToDevice has the following format:

```
SetDIBitsToDevice (hdc, xDst,
    yDst, nWidth, nHeight, xSrc,
    ySrc, nStart, nNum, &bBits,
    &bmi, wUsage) ;
```

The first parameter is the handle to the destination device context on which the bitmap image will be drawn. The next two parameters are logical coordinates within this destination device context where the upper-left corner of the bitmap will appear.

The nWidth and nHeight parameters are usually the pixel width and height of the bitmap. However, you can use values smaller than the ones corresponding to the bitmap, if you don't want to draw the entire bitmap image.

The xSrc and ySrc parameters are usually both set to 0. They could, however, be set to numbers greater than 0, if you're not displaying the entire bitmap image. In this case, xSrc and ySrc are offset from the lower left (not the upper left) of the bitmap.



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Environments

THE DIBDATAADDRESS FUNCTION

COMPLETE LISTING

```
BYTE huge *DibDataAddress (BYTE huge *pDib)
{
    DWORD dwInfoSize = ((LPBITMAPINFOHEADER) pDib)->biSize ;
    int iBitCount, iRgbSize = 0 ;

    if (dwInfoSize == sizeof (BITMAPCOREHEADER))
    {
        if (24 != iBitCount = ((LPBITMAPCOREHEADER) pDib)->bcBitCount)
            iRgbSize = (1 << iBitCount) * sizeof (RGBTRIPLE) ;
    }
    else
    {
        if (dwInfoSize >= 36)
            iRgbSize = ((LPBITMAPINFOHEADER) pDib)->biClrUsed *
                sizeof (RGBQUAD) ;
        if (iRgbSize == 0)
        {
            if (24 != iBitCount = ((LPBITMAPINFOHEADER) pDib)->bcBitCount)
                iRgbSize = (1 << iBitCount) * sizeof (RGBQUAD) ;
        }
    }

    return pDib + dwInfoSize + iRgbSize ;
}
```

Figure 1: This routine returns the address of the bitmap bits from a packed-DIB memory block, which allows you to create a bitmap object from that particular block.

The *nStart* parameter is usually set to 0 and the *nNum* parameter is usually set to the height of the bitmap in pixels. But if you don't want to display the entire bitmap in one call (because of memory restrictions, for example), then *nStart* is set to the first scan row number (starting from the bottom of the bitmapped image) and *nNum* is set to the number of scan lines—just as in *SetDIBits*.

When you display a bitmap in pieces by varying the *nStart* and *nNum* parameters in several *SetDIBitsToDevice* calls, the *xDst*, *yDst*, *nWidth*, *nHeight*, *xSrc*, and *ySrc* parameters should always be held constant.

The last three parameters to *SetDIBitsToDevice* are the same as for *CreateDIBitmap* and *SetDIBits*—a pointer to the bitmap bits, a pointer to a *BITMAPINFO* (or *BITMAPCOREINFO*) structure, and the constant *DIB_RGB_COLORS* or *DIB_PAL_COLORS*.

StretchDIBits introduces three more parameters, which give the capacity to stretch or compress a bitmapped image, or use raster operation codes other than *SRCCOPY*. Basically, you also specify a destination width and a height of the image in logical units.

Be forewarned that using *SetDIBitsToDevice* can be significantly slower than displaying a bitmap from a memory device context using *BitBlt*. The reason is that *SetDIBitsToDevice* has to perform for-

mat and color conversion between the device-independent bitmap specification and the destination device context.

When displaying a bitmap from a packed-DIB memory block, you'll have to obtain the width and height of the bitmap image. These are fairly simple routines, since the bitmap height and width information is stored in offsets from the beginning of the DIB memory block.

RUN-LENGTH ENCODING

At this time, I would like to explore the compression routine optionally used for the bitmap data in DIB files and DIB specifications.

If you knew nothing about file compression and you had to figure out some way to compress 8-bit-per-pixel bitmap data, you'd probably realize that a bitmap image usually contains a lot of repeated pixels. For example, a bitmap portraying a landscape would probably contain long runs of identically blue pixels for the sky. So, you could compress this data by using 1 byte for a repetition count and a second byte for the pixel value.

Of course, you might then realize that a bitmap image probably also contains runs of pixels that don't repeat at all. Perhaps an entire bitmap is like that. The compression scheme you just conceived would result in doubling the size of the data.

Then, you might figure that a repeti-

tion count of zero will never occur, and you could follow a zero byte by a "non-repetition" count. This would indicate the number of pixels that follow that do not repeat.

If you were to do this, you'd be reinventing a compression scheme known as *run-length encoding*, and it would be very close to the type of compression defined for device-independent bitmaps. Run-length encoding is not the most efficient form of file compression, but it's certainly the simplest.

DIB COMPRESSION FOR 8-BIT

The DIB compression scheme is defined only for bitmaps with 8 bits per pixel and 4 bits per pixel. These are indicated by the constants *BI_RLE8* and *BI_RLE4* in the *biCompression* field of the *BITMAPINFOHEADER* structure. If the bitmap is compressed, the *biSizeImage* field must contain the size of the compressed data.

The *BI_RLE8* compression is simplest because each pixel is 1 byte. It works like this:

- The compressed data is in byte pairs. The first byte is a repetition count (from 1 to 255) and the second byte is the pixel. The repeated pixels do not continue past the end of a row.
- Each row of data (except possibly the last) ends with two 0 bytes.
- The end of the bitmap data is indicated by a 0 byte followed by a 1 byte.
- A zero byte followed by a byte value of *n* (where *n* can range from 3 to 255) indicates a run of *n* unrepeated pixels. The *n* pixels follow. This run must contain an even number of bytes. If *n* is odd, the run is padded at the end with an extra byte that is ignored. Again, these non-repeated pixel runs do not continue past the end of a row.

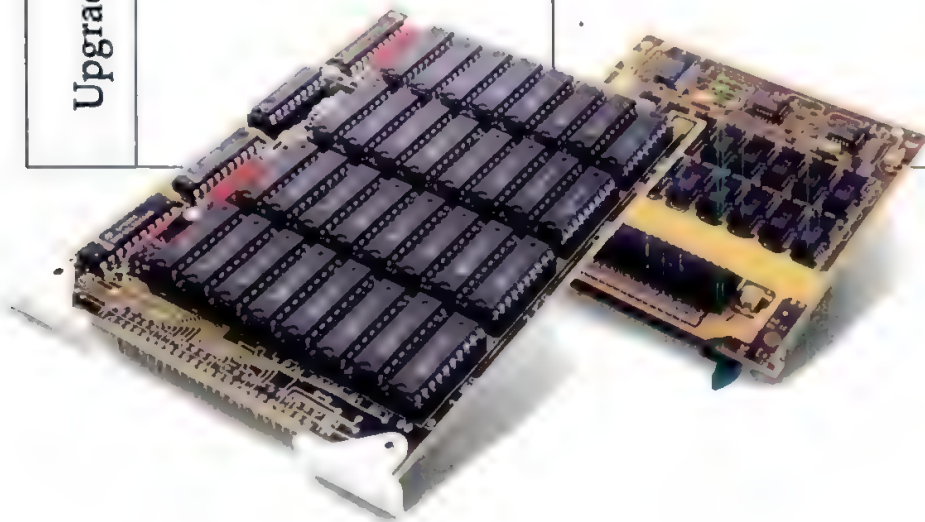
Now we've taken care of all the cases except for a 0 byte followed by a 2 byte. In this case, the next 2 bytes that follow are *x* and *y*. These are treated as unsigned offsets from the current position in the bitmap. The bitmap data continues *x* rows up (recall the bitmap data is stored beginning with the bottom row) and *y* pixels to the right.

This case allows the creation of a "sparse bitmap" (a bitmap with "holes"), which is a bitmap that does not define a complete rectangular image. When I first saw this facility, my immediate reaction was, "What on earth is this good for?"

It turns out that this facility is very useful for compressing the frames of an

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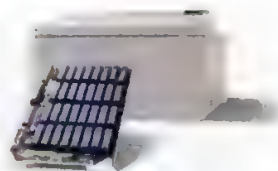


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CIRCLE 264 ON READER SERVICE CARD

Environments

animation sequence. (This use of the term *frame* comes from TV technology.) In an animation sequence, usually only a few pixels change from one frame to the next. The sparse bitmap can store only the pixels that change.

In the worst case—a bitmap with no repeating pixels—this compression scheme increases the size of the bitmap by 2 bytes for every 254 pixels in each row, plus another 2 bytes for each row. This overhead is so small that it's probably safe to conclude that virtually all real bitmaps will shrink in size.

Notice that the compressed bitmap data is in byte pairs, making it fairly easy to scan through the data and find the end of each row and the end of the bitmap. This is important if you're using the `nStart` and `nNum` parameters with `SetDIBits`, `SetDIBitsToDevice`, and `StretchDIBits`.

DIB COMPRESSION FOR 4-BIT

DIB compression for 4-bit-per-pixel bitmaps is very similar to DIB compression for 8-bit per pixel bitmaps, except all counts and offsets are for pixels—not bytes.

For example, suppose you encounter the byte pair `0x05 0x34`. In an 8-bit bitmap, this would refer to a run of 5 pixels of value `0x34`:

`0x34 0x34 0x34 0x34 0x34`

In a 4-bit bitmap, this would refer to a run of 5 pixels or 2½ bytes:

`0x34 0x34 0x3?`

where the question mark indicates a pixel not defined by this run.

Suppose you encounter the following sequence in an 8-bit bitmap:

`0x00 0x03 0x34 0x78 0xAB 0x00`

This refers to a run of 3 un-repeated pixels. (Recall that this run must be padded for an even number of bytes.) The un-repeated pixels are `0x34 0x78 0xAB`.

A similar (but not identical) sequence could be found in a 4-bit bitmap:

`0x00 0x06 0x34 0x78 0xAB 0x00`

6 pixels are represented by 3 bytes: `0x34 0x78 0xAB`.

COMPRESSION AND UNCOMPRESSION

If you use packed-DIB memory blocks only with the `CreateDIBitmap`, `SetDIBits`, `SetDIBitsToDevice`, and `StretchDIBits` functions, then there's no need for you to perform uncompression. `CreateDIBitmap` and `SetDIBits` will uncompress bitmap data in the process of converting format and color to a device-specific format. (GDI bitmap objects are never compressed.)

`SetDIBitsToDevice` and `StretchDIBits` can also accept compressed bitmap data and uncompress it while displaying the bitmap image on a device.

You may be wondering what type of performance overhead is involved when these functions uncompress the data while displaying the bitmap image. To determine this, I experimented with an extreme case: a 256-color bitmap that is 254 pixels wide and 256 pixels high with every row the same color. Uncompressed, the bitmap data is 65,536 bytes long. Compressed, the bitmap data is only 1,024 bytes long (4 bytes for each row).

On my 20-MHz 386 IBM Model 70 with a 16-color IBM VGA, I found that `SetDIBitsToDevice` displayed the compressed bitmap in a ninth of the time required for the uncompressed bitmap data. In fact the compressed bitmap even displayed in two-thirds the time required by the `BitBlt` function for a device-specific bitmap of the same size. (For the 8514/A, the improvements were not as great. Using `SetDIBitsToDevice`, the compressed bitmap displayed in about a fourth to a fifth the time it took the uncompressed bitmap, and this was still over twice the time it took `BitBlt`.)

These results are very encouraging—they mean that GDI doesn't uncompress the bitmap data but allows the device driver to use the repetition factors directly when it's displaying the bitmap image on the screen.

So we see that DIB compression will almost always save space for real-world images, and—at least in the extreme cases—dramatically improve performance when displaying the bitmap image using `SetDIBitsToDevice`. What more could you ask for? (Well, I wouldn't mind seeing some compression and uncompression routines built into *Windows* and available to *Windows* programs.)

In the next issue, I'll discuss how to use DIBs with the *Windows* 3.0 palette manager.

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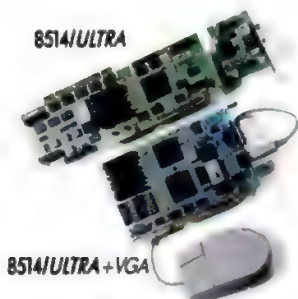


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CIRCLE 540 ON READER SERVICE CARD

by
Ray Duncan

Power Programming

A Look at the Differences Between C and C++

In the spring of 1988, I participated in a panel called "The Language Wars" at the West Coast Computer Faire in San Francisco. Two of the other panelists were Greg Lobdell, the programming-language evangelist for Microsoft, and David Intersimone, Borland's evangelist. These two worthy fellows presented ideas that were very similar: Both expressed a heartfelt commitment to object-oriented programming tools, both paid appropriate obeisance to the imminent triumph of graphical user interfaces, and both predicted that integrated development environments, debuggers, profilers, and project management facilities would become the new competitive battlegrounds as compiler technology matured.

We are now in a position to put these predictions to the test of time and to judge the promoters' words by their companies' actions. As I write this, Borland has shipped no fewer than five different object-oriented programming packages (Turbo Pascal 5.5, Turbo Pascal 6.0, Turbo Pascal for *Windows* (TPW), Turbo C++ 1.0, and Borland C++ 2.0), as well as a novel object-oriented user interface builder (ObjectVision), and has produced the only GUI-based mainstream language for *Windows* on the market to date, TPW. The Borland integrated development environments have evolved steadily, and in their current incarnations they rival high-end programming editors like *Brief* for features and customizability. The auxiliary Borland tools, like TASM, TLINK, Turbo Profiler, and Turbo Debugger, are speedy, well-designed, and a pleasure to use, and the Turbo Debugger for *Windows* is a marvel. The Borland compilers, linker, and debugger can take advantage of 80286 and 80386 features, but they'll still run (and run very well) on 8086 machines with 640K of memory. Finally, the Borland VROOM overlay manager makes it feasible to write large, complex applications that will execute efficiently on even the oldest, slowest PCs.

Microsoft, on the other hand, struggled

■ If you're a veteran C programmer, you may have found C++'s odd notation disconcerting. Luckily, using C++ isn't an all-or-nothing proposition—you can make the move incrementally and (for the most part) painlessly.

and labored to bring forth MSC 6.0, and ultimately produced a product that was an elephant in terms of its demand for machine resources and a mouse in terms of performance. The Microsoft integrated development environment, called Programmer's Workbench, is so big, slow, and clumsy that it is virtually unusable under DOS, and the third version of Microsoft CodeView is still nowhere near as slick and intuitive as the very first version of Turbo Debugger. The new MAKE program (NMAKE) is even weirder than the old one. Microsoft's compiler documentation, formerly excellent, has taken a distinct turn for the worse; you can only get the complete runtime library manual by purchasing a separate book not included in the retail MSC package. As for those Microsoft object-oriented programming languages—C-Sharp and Visual Basic—and the GUI-based development platforms we've been hearing about for so long? They still haven't materialized, six years after the appearance of *Microsoft Windows*

and three years after the release of OS/2 Presentation Manager.

When I began to dabble in *Windows* development again after spending several years with OS/2, I was appalled to see how little Microsoft had done in the meantime to make the lives of *Windows* programmers easier. It's certainly a tribute to the talents of the Microsoft Applications Group that they've been able to bring superb products like *Word for Windows* and *Excel 3.0* to market while being forced to rely on such primitive tools. But the rest of us are free to choose among language vendors, and it took only a few days using Borland C++ 2.0 to convince me to abandon the Microsoft compiler and *Windows* SDK completely. Aside from the overall high quality and performance of BC++, its support for precompiled header files, its Project Manager, which eliminates the need for arcane MAKE and NMAKE files, its multiwindow editor with multilevel undo/redo, and the single-screen Turbo Debugger for *Windows* were more than enough incentive for me to switch and never look back. Borland C++ is not yet perfect—Borland needs to pay some serious attention to code optimization, needs to move BC++ to a true GUI-based implementation like TPW, and needs to add source-code control facilities to the integrated development environment—but it's clear that Borland has taken a commanding lead in programming-tools technology as a whole.

VIEWING C++ AT ARM'S LENGTH

If you're a veteran C programmer raised on the K&R (Kernighan and Ritchie) flavor

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of the language and your curiosity led you to peek at C++ books, you were probably aghast at the bizarre notation and terminology you found. That's how I reacted the first few times I tried to learn about C++. If ordinary C code borders on the cryptic, C++ code can be downright

grotesque, and it uses several traditional C tokens and symbols (such as : and << and >>) in unfamiliar ways. Furthermore, Bjarne Stroustrup, the inventor of C++, invented new and unobvious names for the object-oriented elements of his language, rather than adopting or adapting terms used in predecessor OOP languages like Smalltalk. The effect is that of a bad dream where everyone is using words that sound familiar but don't make sense.

Fortunately, using C++ is not an all-or-nothing proposition. Borland C++ actually consists of two compilers in one development environment: an ANSI C compiler and a C++ compiler that's compliant with the AT&T C++, Version 2.0, specification. The project manager determines which compiler to run against a given source code module by examining the module's extension: .C or .CPP. This allows you to make the move to C++ incrementally and (for the most part) painlessly. You can simply create Borland C++ project files from your old Make files, make any changes necessary to get the program to compile and link properly using the ANSI C compiler, and then migrate the source modules individually to C++ by editing them appropriately and changing their filename extension. Further, since C++ syntax is largely a superset of C, this approach lets you take immediate advantage of some highly useful C++ features without drastically restructuring your programs.

The biggest hurdle you'll have to surmount, if you haven't updated your original C program for ANSI C, is to recast every one of your function declarations in the "new style" and add function prototypes to your application's header files. In K&R's original definition of C, prototypes were unknown, and functions were declared in the following form:

```
myfunc(x, y)
int x;
int y;
{
    ...
}
```

Functions were assumed to return an integer unless otherwise specified. This could lead to problems when modules were compiled separately, because a reference in one module to a function that was defined in another module might assume (for instance) that the function returned an integer, when it actually was declared as returning a double. Neither the compiler nor the linker would report an error in such cases, but the program would behave unpredictably or crash. The possible solutions were not elegant: Either all the functions that referenced a noninteger function had to be defined after that function in the same module, or each calling function had to declare the type of each external noninteger function that it used along with its local data declarations.

As the language evolved, most C



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compilers were enhanced to support function prototypes, which were declarations of a function's value type (separate from the definition of the function) that could be placed in a header file and #included in all modules of a program. The concept of a *void* type was also introduced to allow the compiler to flag the misuse of functions that didn't actually return anything. Such a post-K&R but pre-ANSI function prototype and declaration would look like this:

```
/* function prototype in header
file */
void myfunc();
.
.
.
/* declaration of function */
void myfunc(x, y)
int x;
int y;
{
    ...
}
```

This was a major improvement on the original K&R C, but something was still missing. The prototypes didn't include declarations of the types of the function's arguments, so the compiler still couldn't cross-check the parameters being passed to a function by its callers in other modules against the actual parameter types understood by the function. Stroustrup answered this need in C++ by introducing complete, formal prototypes, and incidentally changing the declarations of functions so that the types and names of its parameters were found together. For example,

```
/* function prototype in header
file */
void myfunc(int, int);
.
.
.
/* declaration of function */
void myfunc(int x, int y)
{
    ...
}
```

This style makes it possible for the compiler to perform complete parameter and

return value type-checking on every invocation of a function. The ANSI C standardization committee, which was meeting during the period that C++ was becoming stabilized, thought this was such a neat idea that it subsumed Stroustrup's style of function prototyping and declaration wholesale into ANSI C—incidentally transforming C from a weakly typed, anything-goes language into a strongly typed language in the process, and making it much more practical to create optimizing C compilers.

I should note that while ANSI C encourages use of the new style of prototype and function declaration, but continues to support the old style with minor limitations, C++ demands complete function prototypes. Since the explicit prototypes

**An interesting aspect
of C++ is that it lets
you declare variables
close to the point
where they are used.**

are easiest to generate and keep in sync if you adopt the new style of function declaration, you might as well make this conversion globally throughout your application as you bring it into compliance with ANSI C. This should make migration of the application to the C++ compiler less painful. Once you've taken this step, however, C++ offers a bonus: the ability to specify default argument values. For example, imagine a graphics drawing function—*circle()*—called with the coordinates of the origin and a radius:

```
void circle (int x, int y,
            int radius=100)
{
    ...
}
```

This C++ function declaration permits the function *circle()* to be called with either two arguments or three. If the caller doesn't supply a radius, it defaults to 100. On the other hand, if the caller fails to supply the *x* or *y* arguments, the compiler will generate an error message.

Another interesting, non-object-oriented aspect of C++ is that it allows you to declare variables and structures close to the point where they are used, in contrast to C's requirement that all data declarations be grouped at the beginning of a function. For example, in ANSI C you have to write

```
void circle (int x, int y,
            int radius)
{
    int i; /* a temporary loop
            index */
    int j; /* another temporary
            index */
    .
    . /* executable code here */
    .
    for(i = 0; i < radius; i++)
    { for(j = 0; j < radius; j++)
      {
          ...
      }
    }
}
```

while in C++ you're allowed to write

```
void circle (int x, int y,
            int radius)
{
    .
    . /* executable code here */
    .
    int i, j;
    for(i = 0; i < radius; i++)
    {
        for(j = 0; j < radius; j++)
        {
            ...
        }
    }
}
```

In many cases, you can even declare a variable in the context of its first usage, such as

```
for(int i=0; i < radius; i++)
```

But this style can also get you into trouble, so it's probably best avoided for now; the restrictions on it aren't obvious until you've learned more about C++'s object allocation and initialization.

Yet another elegant feature of C++ is its improved interface for dynamic memory management. While C++ still supports the traditional C functions *malloc()* and *free()*, it also offers two superior func-

Power Programming

tions: `new()` and `delete()`. These functions know about the sizes of objects automatically, making it unnecessary for you to determine those sizes programmatically, and incidentally improving the readability of the source code and eliminating many opportunities for subtle bugs. For example, in C, you might allocate a pointer to an array of double-precision (64-bit) floating-point numbers and then allocate memory for the array itself, with code something like this:

```
double *darray;
.
.
.
darray = malloc(50 *
    sizeof(double));
```

In C++, you'd allocate the pointer and the memory in the same place with code like this:

```
double *darray = new double[50];
```

Last but not least, we should mention the C++ single-line comment, whose initiator is a double forward-slash. As you know, traditional C comments are delimited by a `/*` token at the beginning and a `*/` token at the end, for example:

```
int i; /* this is a comment */
```

How many times have you been booby-trapped by accidentally deleting, damaging, or nesting one of these comment delimiters in a C source file? Often C compilers give you no useful information at all about such an accident, instead producing either a cascade of error messages, or no error messages at all except for "unexpected end of file." In C++, you can write short comments like this:

```
int i; // this is a comment
```

The end-of-line serves as the comment terminator. This idea of Stroustrup's has proven so convenient that most ANSI C compilers support it even though it's not part of the ANSI C standard.

OBJECT-ORIENTED PROPERTIES OF C++
Now that we've seen some of the characteristics of C++ that we can exploit with-

out abandoning a C-language point of view, let's turn to C++'s support for object-oriented programming. Recall that there are three features of a language that mark it as truly object-oriented: encapsulation, polymorphism, and inheritance.

Encapsulation is a fancy term for information hiding. In a classic object-oriented programming language, procedures (methods) and their variables and constants are hidden inside entities called *objects*, which communicate by means of messages. Each object is an instantiation of an object type or class; the members of a class have different names but symmetric capabilities. The benefit of encapsulation is that a particular object class's implementation can be changed and improved without causing harmful side effects elsewhere.

Polymorphism refers to an object's capability to select the correct internal procedure (method) based on the type of data received in a message. For example, a "Print" object might be sent a message containing a binary integer, a binary floating-point number, or an ASCII string; in an object-oriented programming language, you have a right to expect the object to take the appropriate action (or at least fail gracefully) even if the contents of the message aren't known at the time you write the program.

Inheritance refers to a language's mechanism for deriving a new class of objects from an existing class (subclassing). The new class need only contain the actual code and data for new or changed methods; the code and data for methods that are inherited unchanged from the parent class remain in the parent, and messages not handled by a particular class's unique methods are automatically routed to its parent. Some languages support multiple inheritance—the possibility that a class can inherit methods from two or more completely unrelated parent classes. This is a hotly controversial issue among OOP mavens, and therefore it's one we'll ignore for now.

C++ meets all three of these classic criteria of object-orientedness, but once you really start to take advantage of them in your programs, you'll find you're definitely not in Kansas anymore. Although C++ has just a few more keywords and operators than C, Stroustrup gets a lot of mileage out of them, and while C++ programs can superficially look very much like C programs, they are put together in strange and wonderful ways.

Consider a very simple test-bed program that prompts a user to enter a number and a string, then displays those same items back. In ANSI C, the code would look something like this:

```
int i;
char temp[80];
char buff[80];

printf("Enter a number: ");
gets(temp);
i = atoi(temp);

printf("Enter a string: ");
gets(buff);

printf("Your number is: %d\n", i);
printf("Your string is: %s\n",
    buff);
```

In C++, the code for the same job would look very different:

```
int i;
char buff[80];

cout << "Enter a number: ";
cin >> i;
cout << "Enter a string: ";
cin >> buff;

cout << "Your number is: "
    << i << "\n";
cout << "Your string is: "
    << buff << "\n";
```

This little chunk of code actually illustrates C++'s object-oriented nature very well. `cin` is an object that obtains user input, `cout` is an object that performs formatted output. When you send or get a message to or from `cin` or `cout`, they look at the type of data being requested or sent and take the appropriate actions (polymorphism); the details of how each works are (or at least can be) completely transparent to the caller (encapsulation), and both are instances of subclasses of a more basic class called `iostream` (inheritance).

In the next issue, we'll explore C++'s object-oriented features further.

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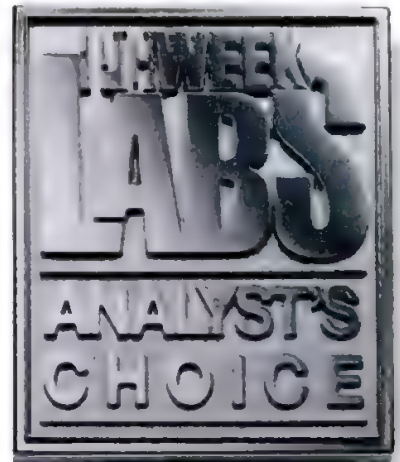
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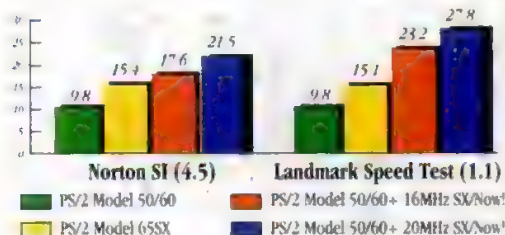


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PCM 791

CIRCLE 106 ON READER SERVICE CARD

by
Fran Finnegan

Windows

UPDATE WIN.INI IMMEDIATELY

As you become more comfortable with *Microsoft Windows*, you'll begin to exercise greater control over various aspects of its operation. For instance, you might find yourself manually editing the *Windows* initialization file (WIN.INI), instead of using the Control Panel (CONTROL.EXE) to make changes. In fact, you'll probably *have to* edit WIN.INI directly, in order to change entries that the Control Panel or other applications don't give you access to. For example, you must make manual changes if you need to remove an entire WIN.INI section used for a printer that you've disconnected. Or, you might want to add the NovellNet, NewLook, or AskForPrinterPicture options available with *Word for Windows*, Version 1.1. These options can only be added manually.

Before making any manual changes to WIN.INI, remember to back up the file! You can edit WIN.INI with either Notepad (NOTEPAD.EXE), the undocumented System Configuration Editor (SYSEDIT.EXE), or any other text editor. SYSEDIT provides an easy way for you to edit not only WIN.INI, but also your CONFIG.SYS, AUTOEXEC.BAT, and SYSTEM.INI files, all from within *Windows*. SYSEDIT also makes automatic backups with an .SYD extension.

As is apparent, you'll have to edit WIN.INI directly as you continue to use *Windows*. But first, you will need to know how the file is organized. The WIN.INI file contains much of the *Windows* environment information and some of the *Windows* applications' configuration information. The information is stored as simple text in a format similar to that of CONFIG.SYS but with numerous sections in the general form

```
[SectionName]
KeyName=String
```

The WININI.TXT file that comes with *Windows* 3.0 offers a complete description of the WIN.INI file format. (The

■ **UPDATE WIN.INI IMMEDIATELY:**
After manually editing your WIN.INI file, run WININI.EXE. This way, your changes will take effect without your having to exit and restart *Windows*.

WININI.TXT and WININI2.TXT files describe the WIN.INI file contents in great detail, so there is no need to go further into it here.)

Windows keeps a copy of WIN.INI in shared memory so it can be used by all applications. Any *Windows* application is free to write information into WIN.INI, although Microsoft now encourages developers to have programs write to their own dedicated .INI files so that the size of the WIN.INI file can be kept down (you'll see the reason for this below). WIN.INI normally gets updated when an application makes the following *Windows* function call in order to insert or change a string entry:

```
WriteProfileString(lpSectionName,
lpKeyName, lpString);
```

The three function arguments refer to the SectionName, KeyName, and String components of the WIN.INI file format. An example would be

```
WriteProfileString("Windows",
"Spooler", "yes");
```

Windows is responsible for updating the string entry in the requested section; *Windows* applications that use this method of updating WIN.INI do not have to write directly to the WIN.INI file, and should never do so. Each time an application makes a WriteProfileString call, *Windows*

updates the copy of WIN.INI it keeps in shared memory and then writes out the entire shared-memory copy of WIN.INI to disk. For this reason, you want to keep WIN.INI as small as possible: It takes memory, and every time a change is made it requires a complete rewrite of the file! Incidentally, that is why there is so much disk activity when you do something like use the Control Panel to change your system colors. Using the above function, all 13 lines in the [Colors] section are changed *one at a time*, so the entire WIN.INI file gets written out 13 separate times! And Control Panel does this when you hit OK in the Colors dialog box even if you don't change any colors.

Understanding the procedure by which *Windows* updates WIN.INI, you should never use the Control Panel or any other application that may change WIN.INI while you have a copy of it in your text editor (Notepad, SYSEDIT, and so on). The text editor reads the WIN.INI file into the editor's own private memory space. Any changes made in the text editor affect only this private-memory version of WIN.INI, and not the shared-memory version. And any changes to it obviously will not go into the WIN.INI file itself until you save the file. But you should note that if you use Control Panel or another application in the meantime to change something before you save WIN.INI from your editor, you run the risk of overwriting Control Panel's changes or the application's changes when you eventually do save the file.

After executing the WriteProfileString call, *well-behaved* applications are supposed to notify other applications that the shared-memory copy of WIN.INI and, hence, the file itself have been changed. This procedure gives other programs the opportunity to ask *Windows* for any WIN.INI information relevant to them. This notification is made by sending all applications a WM_WININICHANGE message, which is accomplished by the following call:



Figure 1: WININI is a *Windows* program in C that causes *Windows* to refresh the shared-memory copy of the WIN.INI file with the version that exists on-disk.

```
SendMessage(0xFFFF,
WM_WININICHANGE, 0, 0L);
```

Neither Notepad nor SYSEDIT make this call, because they do not change the *shared-memory* copy of WIN.INI; they only change the WIN.INI *file*. Herein lies the problem with editing the WIN.INI file manually: Whether you use Notepad, SYSEDIT, or another editor to make changes, you are editing a disk file and not the copy of WIN.INI that applications “see” in shared memory. This is because *Windows* will service application requests for WIN.INI information from the shared-memory copy of it; any WIN.INI file changes you make with a text editor (by using the text editor’s private memory) will not be reflected in the shared-memory copy of WIN.INI!

Is it possible to use a text editor and still have your WIN.INI file changes take

**Any WIN.INI changes
you make with a text
editor will not be
reflected in the
shared-memory copy.**

effect (in *Windows*’ shared memory) without exiting and restarting *Windows*? Yes, by forcing *Windows* to write out the shared-memory version of WIN.INI after you’ve finished making those changes. This may seem counterintuitive. It seems like the file changes that you’ve just made should be overwritten by the shared-

memory version of WIN.INI. *But if you’ve saved the WIN.INI changes, it doesn’t work that way.*

Before updating the shared-memory copy of WIN.INI in response to a WriteProfileString call, *Windows* checks the time-stamp, which notes the last time you saved the file. If the time-stamp is different than when *Windows* last wrote to WIN.INI, *Windows* will reread the file and replace the shared-memory version with the version on-disk. It will *then* change this new shared-memory version and write the file back out to disk.

One way to get *Windows* to do this is to use an existing application, like the Control Panel. Most of what you do with the Control Panel results in WIN.INI’s being rewritten. All you have to do is find an easily accessible option to change. The Sound option is one that does the trick. All you have to do is hit OK. You don’t even have to change the Warning Beep check box. You should see some disk activity when you do this.

Another way is to use a small program I’ve written called WININI.EXE—easier and quicker than using the Control Panel. WININI.EXE uses the WriteProfileString function in such a way as to force the update of the shared-memory version of WIN.INI without actually changing anything in the WIN.INI file.

WININI.EXE’s source code, written in Microsoft C 5.1, is shown in Figure 1. As you can see, the program makes calls to just three *Windows* functions: WriteProfileString, SendMessage, and MessageBox. The WriteProfileString call forces the shared-memory and disk versions to be identical, without changing the contents of WIN.INI, by removing a WIN.INI section that shouldn’t exist. The SendMessage call informs all applications that WIN.INI (may have) changed. The MessageBox call informs the user that WIN.INI has been reread into shared memory.

WININI *only* forces a new version of the WIN.INI file into shared memory and informs all the other executing applications that WIN.INI has changed. However, it is the responsibility of each running application to respond to the WM_WININICHANGE message and change anything internally that the user changed externally in the WIN.INI file. Properly coded applications will do so.

Some parts of *Windows* won’t always be affected by manually editing WIN.INI. The [Colors] section is one example. An

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CIRCLE 304 ON READER SERVICE CARD

Windows

application must make specific calls to the *Windows* kernel in order to change the system colors list. This is exactly what my COLORS.EXE utility does (see the May 28, 1991, *Windows* column). Upon recognizing that WIN.INI has been changed manually, COLORS rereads the

[Colors] section and makes the appropriate calls to the *Windows* kernel. Moreover, not all of the entries in the [Windows], [Desktop], and [Fonts] sections will be changed internally in the *Windows* kernel unless an application such as Control Panel makes the change. This, too, is because specific *Windows* functions must be called.

As you can see, *Windows* programs don't necessarily have to be long and

complicated in order to accomplish useful things. In fact, WININI is composed of just one C function (WinMain), which calls three *Windows* functions (WriteProfileString, SendMessage, and MessageBox). To create WININI, you need the Borland C++ for *Windows* compiler or the *Microsoft Windows* Software Development Kit (SDK) and its compiler.

But I think you'll find it easier to just get WININI.EXE from PC MagNet (type GO PCMAGNET in CompuServe). WININI.EXE is available in the *Windows* section (in Library 10) of the UTILITIES/TIPS forum. It is also available there as WININI.ZIP.

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CIRCLE 243 ON READER SERVICE CARD

WININI.EXE is proof
that *Windows*
programs don't
necessarily have
to be long and
complicated in
order to accomplish
useful things.

You can install WININI as a Program Manager icon by picking a desired group, choosing the File New command, and then Program Item. I enter the Description "WIN.INI Changed" in the Program Item Properties dialog box and set up my copy of WININI next to SYSEDIT in my Main group. This arrangement helps me remember to run it after running SYSEDIT.

OPENING WINDOWS

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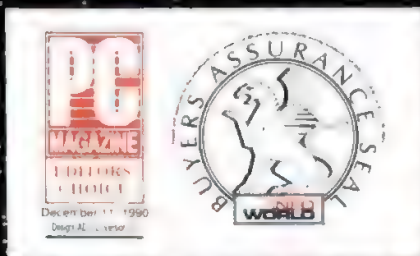
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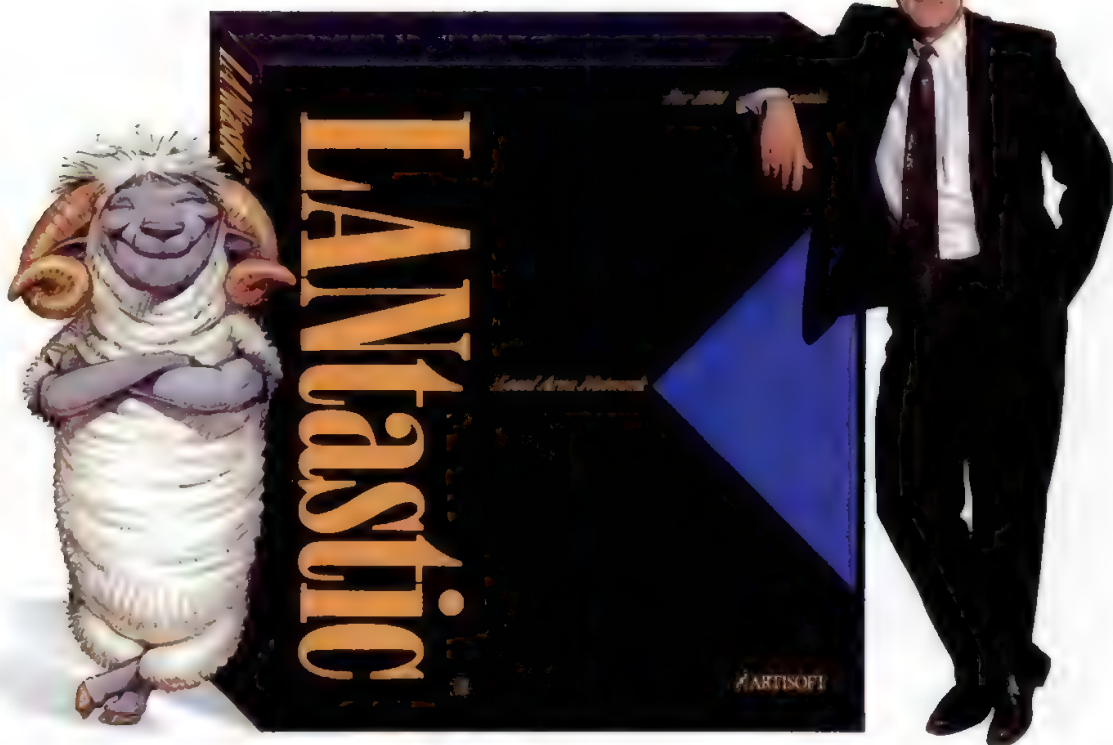
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Databases

GETTING A CHOICE IN FOXPRO

The PROMPTYN user-defined function shown in Figure 1 can be used in your *FoxPro* programs to present two choices. You can call it as follows:

```
memvar = promptyn()
```

The function displays a small window, centered horizontally and vertically, with the message:

```
Please Choose: Yes No
```

When the user makes a selection, it will be returned in the variable **memvar** as a character string containing either Yes or No. This short program demonstrates how you might use PROMPTYN in your programs:

```
* PROCEDURE vote
@ 1,0 SAY "Did you vote in the
last election?"
my_memvar = promptyn()
REPLACE voted WITH my_memvar
```

Moreover, you can condense this a bit by including some parameters in the call to PROMPTYN(). A second version might look like this:

```
* PROCEDURE vote
my_memvar = promptyn("Did you vote
in the last election?")
REPLACE voted WITH my_memvar
```

Now this message will be displayed in the box instead of "Please Choose:". In fact, it's possible to collapse the entire program into a single line:

```
* PROCEDURE vote
REPLACE voted WITH
promptyn("Did you vote in the
last election?")
```

The PROMPTYN function can accept up to six options. The first option is the message you want to display. The second and

■ **GETTING A CHOICE IN FOXPRO:** Here's a flexible user-defined function that pops-up a window and presents two choices.

third options list the specific choices given to the user. In *FoxPro*, all optional arguments are separated by commas. You can substitute your own text for the default

Yes/No prompts. For example the line

```
my_memvar = promptyn("When did
you vote?", "AM", "PM")
```

will allow you to use the choices AM and PM instead. The fourth and fifth options let you specify the row and column for the top-left corner of the box. Finally, the sixth option lets you place a title in the top bar of the box in addition to the message that appears in the center.

Do note that I tested PROMPTYN() only with *FoxPro*, Version 1.02. (If you wish to, you can check which version you

THE PROMPTYN FUNCTION

1 of 2

```
FUNCTION promptyn
PARAMETERS mess, choice_1, choice_2, top, left, win_title
*
* mess      = <exp_C>, message to display in the box
* choice_1  = <exp_C>, first of the two choices
* choice_2  = <exp_C>, second of the two choices
* top       = <exp_N>, top row of the window
* left      = <exp_N>, left column of the window
* win_title = <exp_C>, appears on top bar of window
*
*****
* Local Memory Variables *
*****
PRIVATE promptvar, ret_val

* Initialize the menu variable
promptvar = 1

* What we return to the calling .prg
ret_val = SPACE(5)

*****
* Fill in some parameters if they weren't passed *
*****
IF PARAMETERS() < 1 .OR. EMPTY(mess)
    mess = "Please Choose:"
ENDIF

IF PARAMETERS() < 3 .OR. (EMPTY(choice_1) .AND. EMPTY(choice_2))
    choice_1 = "Yes"
    choice_2 = "No"
ENDIF

* Pad everything with spaces to make it look nicer
choice_1 = " " + choice_1 + " "
choice_2 = " " + choice_2 + " "

*****
* Calculate prompt window size and location *
*****
* Figure out our prompt window width
winwidth = MIN(LEN(mess) + LEN(choice_1) + LEN(choice_2) + 5, ;
SCOLS())

* Now the location, more parameters if necessary
IF PARAMETERS() < 4
    top = 99                !! Set to 99 if top is not specified
ENDIF

* If top not specified_or_passed 99
IF top = 99
    top = INT((SROWS()/2)-2) !! calculate center based on screen rows
ENDIF
```

Figure 1: PROMPTYN, a user-defined function, lets you present a choice between two options.

THE PROMPTYN FUNCTION

2 of 2

```
bottom = top + 4
* If left not specified _or_ passed 99
IF PARAMETERS() < 5
    left = 99          ** Set to 99 if left is not specified
ENDIF
IF left = 99          ** calc center based on screen columns
    left = INT((SCOLS()-winwidth)/2)
ENDIF

right = left + winwidth

*****
* Define and activate the window *
*****
IF PARAMETERS() < 6
    DEFINE WINDOW promptwin FROM top,left TO top+4,right PANEL
ELSE
    DEFINE WINDOW promptwin FROM top,left TO top+4,right PANEL ;
    TITLE " " + win_title + " "
ENDIF
ACTIVATE WINDOW promptwin

*****
* Put the choices on the screen *
*****
@ROW()-2,1 SAY mess
@ROW(),COL()+1 PROMPT choice_1 MESSAGE " "
@ROW(),COL()+1 PROMPT choice_2 MESSAGE " "
MENU TO promptvar

*****
* Clean house and go home *
*****
RELEASE WINDOW promptwin
IF EMPTY(promptvar)          ** They pressed <escape>
    ret_val = ""
ELSE
    ret_val = IIF(promptvar=1,ALLTRIM(choice_1),ALLTRIM(choice_2))
ENDIF
RETURN ret_val
* eof
```

TPROMPT.PRG

COMPLETE LISTING

```
*****
* TPROMPT.PRG - Example use of PROMPTYN.PRG
*****
SET TALK OFF
SET ECHO OFF
SET BLINK OFF
SET SYSMENU OFF
SET PROCEDURE TO PROMPTYN
CLEAR
pcmag="PC Magazine PC Magazine PC Mag";
"azine PC Magazine PC Magazine ";
"PC Magazine PC Mag"
single = CHR(218)+CHR(196)+CHR(191)+;
CHR(179)+CHR(217)+CHR(196)+CHR(192)+;
CHR(179)
@ 0,0,23,79 BOX single
1 - 1
DO WHILE i <= 22
    @ i,1 SAY pmag
    i = i + 1
ENDDO
SET COLOR OF SCHEME 1 TO , , BG/8
voted = promptyn("Did you vote in the last election?","","99,99,"Voter Info")
vtime = promptyn("When did you vote?","AM","PM",99,99,"Voter Info")
RETURN
```

Figure 2: This example program incorporates the PROMPTYN UDF. The resulting screen display, with the PROMPTYN window active, is shown on the right. TPROMPT makes two calls to PROMPTYN to obtain voter information.



have by typing ? VERSION() in the command window.)

Steve Friedes
New York, New York



Many applications need to present a simple yes/no option or some other choice between two possible options. This is a flexible, reusable approach to satisfy that need.

The PROMPTYN function defaults to a simple yes/no dialog when no parameters are passed. You can use 99 as a placeholder when you want to use the default row and column positions and you also want to specify a window title. For example:

```
promptyn("", "", "", 99, 99, "Cash")
```

would use default values for everything except the title "Cash."

The function automatically centers the dialog on the display by calculating the window coordinates using FoxPro's SROWS() and SCOLS() functions, which return the number of rows and columns available on the display. Friedes also illustrates the use of the PARAMETERS() and EMPTY() functions to determine the presence or absence of parameters.

Figure 2 shows an example of a program that uses this function and the resulting screen display.

The PARAMETERS() function returns the number of parameters passed by the calling routine. If it returns zero, then no parameters were passed. The EMPTY() function returns .T. if the value it tests has an "empty" value. For example, a null character string ("") or a string that has only blanks would cause EMPTY to return .T.. So, if PROMPTYN's first parameter (mess) were passed as "", EMPTY (mess) would return .T. and PROMPTYN would know to use the default message.

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by
Craig Stinson

Spreadsheets

ONE FILE, TWO WINDOWS

In converting my *Lotus Symphony* data files to a *Microsoft Excel* 2.1c format, I encountered what appears to be an *Excel* windowing limitation. In *Symphony* I could run one window that displayed the range A1..F6 and set the width of column A to 3 characters. In another window of the same file, I could display the range A10..G40 and set the width of column A to 10 characters.

When I converted this file to *Excel* and created separate windows, I found that column A had to have the same width in each window. That doesn't suit my purposes. Is there a way around this?

Ronald Hinds
Santa Cruz, Trinidad

 The only workaround I know of is clumsy and probably won't suit your needs either. You can open a second window on your worksheet, then choose the Display command on the Options menu. In the dialog box, put an X in the Formulas check box. Each column in the second window will then be twice as wide as the corresponding column in the first window. Unfortunately, all formulas in the second window will now be displayed as formula text. If your worksheet consists mostly of labels and constants, though, you might find this a useful ruse.

Excel also refuses to let you split a worksheet into two windows and then apply different display formats to the same range in each window. You can display formula text in one window and results in another, but you can't display a given cell in, say, Currency format in Window 1 and General format in Window 2.

These windowing limitations are, as Hinds notes, a real "pane."

GETTING THE SPACE OUT

From a former colleague, I have inherited 46 large *Lotus 1-2-3* worksheets. Unfortunately, he was in the habit of erasing data by pressing the Spacebar once, instead of by using the /Range Erase command!

■ **ONE FILE, TWO WINDOWS:** When you bring up one *Excel* file in two windows, watch out for formatting limitations.

■ **GETTING THE SPACE OUT:** Use a 1-2-3 macro to weed out cells that look empty but aren't.

■ **NO MORE FILE OVERWRITE:** When you issue a File Save command in *Lotus 1-2-3*, here's a simple trick to prevent the damage of any hasty actions.

Can you provide a Release 2.2 macro to help me convert these spaced-out cells to blank cells?

Norman Perry
Lanexa, Kansas



Cells that appear empty but aren't are hazards. They use memory unnecessarily, interfere with navigation via the End key, cause macros to behave in unexpected ways—there's just nothing good to be said for them! They're also a nuisance to get rid of, because you can't see them by scanning the worksheet.

You might suppose that the /Range Search command in 1-2-3, Release 2.2 and 3.x, would help you ferret out these noxious nonentries. Unfortunately, this command isn't up to the task. Since /Range Search doesn't let you stipulate that the search string be the entire contents of a cell, it will locate every space character in your worksheet, not just those cells that contain only space characters.

And even if /Range Search could help you find the unwanted blanks, its Replace option would be of no help in eliminating them. Replacing the space character with no character at all would still leave a label prefix in the cell.

Therefore, the only way to automate this waste removal is to write a macro that walks through the worksheet, check-

SPACEOUT.WK1		COMPLETE LISTING
1	A	{indicate Cleanup in progress}{paneloff}{windowsoff}
2		/rncHERE" {bs}"
3		{home}
4		/rncWORKAREA" {bs} . {end} {home}"
5		{for HEIGHT,1,@rows(WORKAREA),1,LOOP1}
6		{goto}HERE"
7		/rndWORKAREA"/rndHERE"
8		{indicate}
9		
10	LOOP1	{for WIDTH,1,@cols(WORKAREA),1,LOOP2}
11		{down}{left WIDTH-1}
12		
13	LOOP2	{if @cellpointer("type")<>"1"}{right}{return}
14		{if @left(@cellpointer("contents"),1)<>" "}{right}{return}
15		{if @right(@cellpointer("contents"),1)<>" "}{right}{return}
16		{if @length(@cellpointer("contents"))<4}/re"/rfr"
17		{right}
18		
19		
20	WIDTH	
21	HEIGHT	

Figure 1: If you've erased cells by simply pressing the Spacebar, you can eliminate these "nonblank" cells by running SPACEOUT.

Spreadsheets

DELABEL.WK1		COMPLETE LISTING
A	B	
1	\A	{indicate Cleanup in progress}{paneloff}{windowsoff}
2		/rncHERE~{bs}~
3		{home}
4		/rncWORKAREA~{bs}~{end}{home}~
5		{for HEIGHT,1,@rows(WORKAREA),1,LOOP1}
6		{goto}HERE~
7		/rncWORKAREA~{bs}~
8		{indicate}
9		
10	LOOP1	{for WIDTH,1,@cols(WORKAREA),1,LOOP2}
11		{down}{left WIDTH-1}
12		
13	LOOP2	{if @cellpointer("type")<>"1"}{right}{return}
14		{if @length(@cellpointer("contents"))=0}/re~/rfr~{right}{return}
15		{if @left(@cellpointer("contents"),1)<>" "}{right}{return}
16		{if @right(@cellpointer("contents"),1)<>" "}{right}{return}
17		{if @length(@cellpointer("contents"))<4}/re~/rfr~
18		{right}
19		
20		
21	WIDTH	
22	HEIGHT	
23		
24	ERRCHECK @code(@cellpointer)	

Figure 2: DELABEL searches for and erases cells that contain only label prefixes.

ing out each cell in turn. There are undoubtedly a lot of ways to do this; Figure 1 lists one.

SPACEOUT.WK1 starts by naming the current cell HERE so that it can return to that cell on completion. Then the macro goes {home}, creates a range named WORKAREA extending to {end}{home}, changes the mode indicator to let you know what it's doing, and begins policing the worksheet.

The {indicate} command is advisable because on a large worksheet SPACEOUT can easily take five minutes or more to complete. During this time, the only other sign you'll see is the CMD light at the bottom of the screen. (In Release 2.01, the {indicate} command can use only the first five characters of its argument. That will leave you with the word Clean, which should still be enough to tell you what's going on.)

For each cell in the worksheet, the macro executes the four tests in LOOP2. The four tests are as follows: Is it a label? Is its first character a space? Is its last character a space? Is it less than four characters in length? If the cell meets all four, it's deemed to be a waste cell, and the macro performs both a /Range Erase and a /Range Format Reset on it. (The latter is included because erasing a cell does not reset its format to the global default, and format assignments use memory even when assigned to empty cells.) If any of the four tests proves negative, the

macro moves immediately to the next cell. On completing its rounds, the macro returns to HERE, deletes the range names WORKAREA and HERE, and resets the mode indicator.

If your worksheets never use space characters to achieve indented labels, you could eliminate the third and fourth tests and speed up execution somewhat. If you're sure you never end an indented label with a space character, you can safely do away with the fourth test. If you occasionally write indented labels consisting of a single character followed by a space, change <4 in the fourth test to <3. (In that case, however, your macro will not delete entries consisting of three space characters.)

This macro does not check for cells that contain only label prefixes. If you want to search and destroy these phantoms as well, you can test each label cell to see if its length is 0. Figure 2 shows how to modify the LOOP2 routine to accomplish this.

NO MORE FILE OVERWRITE

In Lotus 1-2-3, Release 2.x, when you type /FS to save a new file for the first time, the program presents a horizontal menu of the .WK1 files that currently exist and highlights the first item on this menu. If, in your eagerness to save your new file, you forget to supply a filename, your new file overwrites the existing one. I have discovered and rediscovered this hazard the hard way.

Here's my solution: In each directory I keep worksheet data, I've created two dummy files: AAAAAAAA.WK1 and AAAAAAAB.WK1. These files are empty except for the worksheet name, which is entered in cell A1.

These dummy files always appear at the beginning of 1-2-3's horizontal file menu, so if I err and save a worksheet without first naming it, the new file goes into one of these "empty" worksheets and does not overwrite anything valuable.

After I have recovered from the panic of not being able to find my file under the name I thought I had given it, I can retrieve AAAAAAAA.WK1 and save it with the name I originally intended, heave a sigh of relief, erase AAAAAAAA.WK1, retype its name in cell A1 for the inevitable next time—and go on about my business.

Jeremy B. Clark
Kingston, Jamaica



Clark's idea of forcing 1-2-3 to supply a dummy filename as a default the first time you commit a new file to disk should save many a worthy worksheet from untimely demise. His technique should prove useful not only in 1-2-3, Release 2, but in all other programs that emulate Release 2. This includes Quattro, Quattro Pro, and the various incarnations of VP-Planner.

Clark's solution (implemented somewhat differently) was adopted by both Microsoft Excel and 1-2-3, Release 3, to eliminate the accidental-overwrite hazard. In both programs, when you save a file for the first time, you're given a dummy filename as a default. In Release 3, the dummy name is FILE0001.WK3; in Excel it's SHEET1.XLS. Quattro Pro appears to work like Excel and Release 3. As you build a new worksheet, the program displays the dummy name SHEET1.WQ1 at the bottom of that sheet. Unfortunately, though, when you go to save the file the first time, it behaves just like Release 2; the default filename is the one that comes first in the alphabetical list of existing files.

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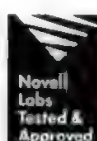
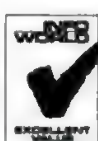
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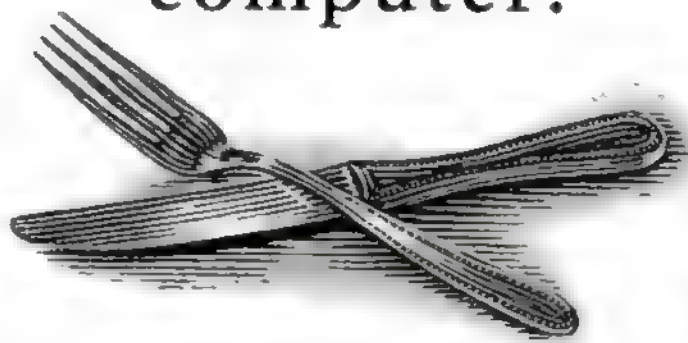
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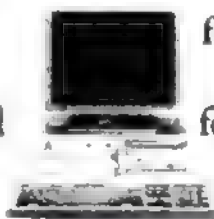
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CIRCLE 472 ON READER SERVICE CARD

by
Costa Rodis

The Working Word

LINES FALLING FROM A HEADER

Using *WordPerfect* I've created several forms where text is printed in columns. Those columns need to be separated with lines extending from the top to bottom of the columns on each page. By selecting the Graphics (Alt-F9) option Line (5), you can specify the starting position of a graphic line as a specific coordinate. In this way the lines you create hang from the header into and through every page of your document exactly as specified.

In the forms I've created, I have set up the lines to begin in my header and end in the footer. The effect is a top-to-bottom division of the columns of the page. Since these lines are in a header, I don't have to worry about how the text may change or how many pages I have, and each page has perfectly spaced lines.

Stephen Fournier
Everett, Washington



By using his header effectively, Fournier has the right idea for maintaining graphic consistency from page to page. Not only can you hang lines from a header, but you can hang frames, suspend horizontal lines, and accurately position graphic images as well. Or, if you prefer, you can support lines, frames, horizontal lines, or graphic images from a footer.

The process is fairly straightforward. When you know exactly where a vertical line is to be positioned and how long it should be, either create a header (Shift-F8, P,H,A,P) at the top of the document or edit the current header (Shift-F8, P,H,A,E). Now press Alt-F9, Line (5). At this point you're asked to create or edit horizontal or vertical lines. Choose Vertical (2) and you are faced with a five-choice menu. Horizontal Position (1) allows you to indicate how many inches from the left edge of the paper you want the line to begin. You can also choose Left Margin or Right Margin if you would like, but the option Between Columns

■ **LINES FALLING FROM A HEADER:** A procedure that combines *WordPerfect* header and graphics features offers a quick way to insert column-dividing lines that will continue across pages.

■ **DEALING WITH PESKY .BK! FILES:** The *WordPerfect* backup files can often interfere with file management. Here are a couple of ways to organize them and keep them out of the way.

■ **COUNTING WORDS IN WORD:** Over the years, users have come up with various schemes. But the one noted here may be the easiest.

won't work from a header or footer.

You determine how far down the page, in inches, the line will begin using the Vertical Position option (2). Here, you simply choose Set Position (5) and type in a number; choosing Full Page, Top, or Bottom will invalidate the Length of Line option, which you fill in next. With Length of Line (3) you choose how far the line will extend. The standard line width is 0.013 inches, but you can change that to a width you prefer using the Width of Line option (4); if you should enter the width as a fraction, *WordPerfect* will automatically convert it to decimal format. Gray Shading (5) should always be set at an even 100 percent unless you have a thick line that would look better as a shade of gray. Of course, you can use Line Width and Gray Shading (at 10 percent) together

to create back-shading for text.

When you're finished creating and positioning the first line, press Enter. Then to create the next, press Alt-F9 again and follow the same procedure as outlined above. Continue with this process until you have all the lines you want.

Within the header, you can also create text frames—up to a full page in size—for each page by using an empty Graphic Figure (Alt-F9, Figure (1)) with Wrap Text Around Box (8) set to No. Alternatively, you can use an empty Equations box (Alt-F9, Equation (6)) for the same result.

You should be aware that text frames cannot exceed the current margins. The result is a frame that actually touches your text. So you might want to create smaller margins before creating the header that contains the text frame. Then open up the margins again after the header or footer code. For example, at the top of the page where you want the text frame to begin, press Shift-F8, Page, Margins to reset Top and Bottom Margins. If the margins are currently set at 1 inch, change them to 0.75 inch. Now select Format (Shift-F8) again and this time choose Line, Margins. Like the page margins, reduce the Left and Right margins here by a quarter inch. At this point create your header, press Alt-F9, and choose the type of text frame you want to use. Choose Options (O) to set the type of border, gray shading, and so on. Exit from the header and create new Page and Line margins for your text. You'll find that the text frame will not touch the text it encompasses.

DEALING WITH PESKY .BK! FILES

While in *WordPerfect*'s List Files screen, I often use the Name Search function to find a file. But since I've enabled the program's backup option, and since the files are listed in alphabetical order, a .BK! version of a file usually precedes the working version. For example, SMITH.LTR follows SMITH.BK!. This arrangement

The Working Word

means I have to type more characters to move the cursor to the correct name, or I have to move the cursor manually to get to my working file.

Last week I performed those extra steps for the very last time. Using *PC Tools*, I searched for and changed the string "BK!" to "ZZ!" in the WP.EXE program file. It may seem trivial or sound dangerous, but I've silenced a pet peeve and I am happier this week than last.

Ben Hartman
(via PC MagNet)



If you want, *WordPerfect 5.1* will automatically create a backup copy of your work whenever you exit a retrieved document. You can enable (or disable) the Original backup option by going into Setup (Shift-F1), and selecting Environment (E), Backup Options (B), Original Document Backup (O), and choosing Yes (or No). The backup, given the extension .BK!, is a version of the document as it existed

before you retrieved it. This is, on one hand, a very practical option. But a directory cluttered with twice the number of files as you've actually created can seem an impenetrable thicket when you're

**WordPerfect 5.1 can
automatically create a
backup copy of your
work whenever you exit
a retrieved document.**

casting about for the right document. And policing these backups is no trivial matter when you've got more than 20 files in your directory.

Hartman's frustration may be understandable, but I would not recommend that anyone follow his example. Altering the WP.EXE file in this way may not harm *WordPerfect* operation, but you'd

have to repeat the process each time *WordPerfect* is updated or upgraded. Other solutions can be equally effective without tampering with an executable program file.

To make a "sweep" of your backup files, you can try this idea. First create a Backup directory: Tap F5 (List) and Enter; choose Other Directory (7) and enter the name BACKUPS; you'll be prompted to "Create BACKUPS? No (Yes)." Tap Y. Now you can move all your backup files to the BACKUPS subdirectory any time you like. If you're in a document or on a blank document screen, tap F5, type *.BK!, and hit Enter; a list of the files will appear. If you already have the List Files screen in front of you, move the cursor to Current <DIR>, tap Enter, type *.BK!, and hit Enter again. All the backup files will be listed. Tap Home and then * (or Alt-F5) to mark all files. Choose Move/Rename (3) and to the prompt "Move marked files?" answer Yes. Type out the name BACKUPS and hit Enter.

All the marked files will be copied to the BACKUPS subdirectory and deleted from the current directory. If a file of the same name already exists in the BACK-



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UPS directory, you'll be prompted: "Replace? No (Yes)." Usually, you'll want to respond with a Y.

You may simply wish to delete those backups that you feel are not needed. In this case, get a list of all backup files (F5, *.BK!, Enter) and use the asterisk (*) to mark the files you want to delete. Hit the Del key or choose Delete (2) from the menu. At the prompt, answer Yes to deleting marked files. If you answer No to the "Delete Marked Files?" question, you are choosing to delete the *highlighted* file instead of the marked files. This is usually the file just *after* the last one you marked with an asterisk, and it's probably *not* one that you want to delete. So if you press N for No, press N again right away to say No, so that you don't delete the other file either.

COUNTING WORDS IN WORD

There is no straightforward way to get a word count in *Microsoft Word* 5.0 or 5.5. The closest thing is to print the current

document to the printer or to disk. *Word* displays the number of words printed at the end of the task. But if you don't want to waste paper or disk space, I have a pretty quick way. Start by selecting Print File as though you were printing the current document to a disk file. When you're prompted for a filename, type NUL and press Enter. NUL is a null device/file in DOS. The DOS filename NUL directs the file nowhere. So *Word* prints the file to a nonexistent disk file. After the task is finished, *Word* as usual indicates the number of words printed, in a message at the bottom of the screen.

Greg M. Perry
Tulsa, Oklahoma



A number of complex word-count schemes for *Microsoft Word* have been created over the past several years, but none has been as simple as this. The only reservation people may have with this technique is that it can't easily be turned into a macro. When a macro runs, it automatically replaces or clears the default prompt at the bottom of the screen. Even using a **SET echo = "on"** command won't retain the page-count

prompt. Your only luck would be to read the prompt as it flashes briefly on-screen.

The way to print to a NUL file in *Word* 5.0 is to tap Esc to bring the cursor to the menu and then tap P, or click on Printer with the mouse. Choose File (F) and enter the word NUL. At the bottom-left of the screen, you'll see the words "y lines and x words counted," where y and x are numbers. This prompt will remain there until you choose a new action.

In *Word* 5.5 you hold down Alt and tap F to open the File menu, or you can click on File with the mouse. Then choose Print, Alt-F for File, and enter the word NUL. The text will be sent to the NUL device and a word-count prompt just like the one in the earlier version will appear.

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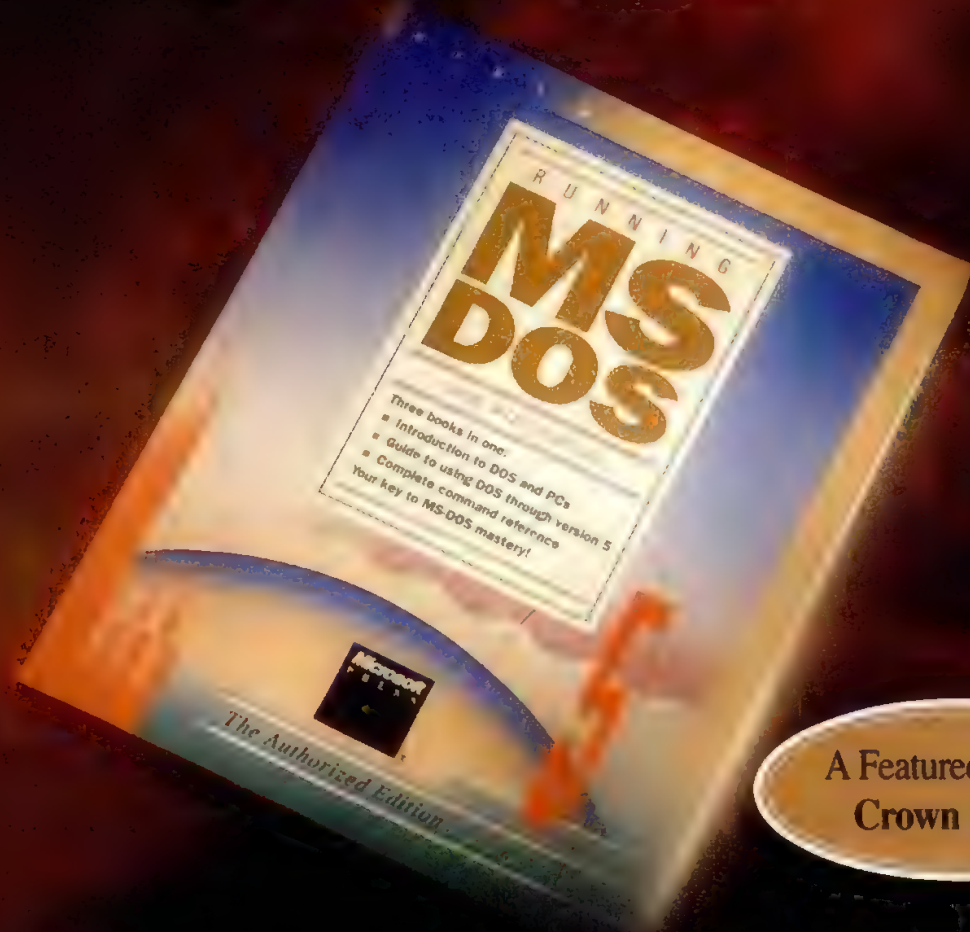
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by
Neil J. Rubenking

User-to-User

ENHANCING THE FOR COMMAND

The DOS manual clearly states that there are two different kinds of internal DOS commands: standard commands and batch file commands. As you've often pointed out in your column, the distinction is an artificial one, and certain batch commands, notably FOR, can be quite useful from the command line as well. In fact the authors of the DOS manual mention the different syntax required when using FOR at the DOS prompt, specifically that you don't double the percent sign when referring to the FOR command's replaceable parameter.

What they don't mention in the manual is that the command following DO can only be an internal command or a .COM or .EXE program. It can't be the name of a batch file. I found this out recently when I tried to use the FOR command to print a number of files, each on a separate page. First, I created a small batch file called PRIT.BAT as follows:

```
COPY %1 PRN
SAY 12 > PRN
```

where SAY is a *PC Magazine* utility that, in this case, simply sends a form-feed character to the printer. Then I issued the command

```
FOR %F IN (*.PRG) DO PRIT %F
```

The first file printed out fine. Then the printer stopped and the DOS prompt reappeared.

After a few moments of thought, I realized that this is just what would have happened if the FOR command had been part of a batch file and I had used it to invoke another batch file. The solution, in that case, would be to use the CALL command rather than just the name of the second batch file. So that's what I tried, using the following command:

```
FOR %F IN (*.PRG) DO CALL PRIT %F
```

■ **ENHANCING THE FOR COMMAND:** Use CALL with FOR at the DOS prompt to run a batch file in a FOR loop.

■ **EASIER PRINTER CONTROL:** These little batch files let you control your printer from the keyboard.

And eureka! It worked! Apparently, the FOR command generates a kind of "internal batch file" for DOS, containing the individual commands it generates. Jumping out of that internal batch file to execute a real batch file has the same effect as jumping out of one real batch file to execute another.

At any rate, it turns out that CALL—the one batch command I thought could never serve any purpose at the DOS command line—can indeed be of considerable use.

By the way, for those unfamiliar with the FOR command, it's worth pointing out that the name of the replaceable parameter *must* be a single letter from A to Z, that is %A to %Z. The first time I tried to use it, I used a two-character variable name, %II. Needless to say, it didn't work and it took me a while to figure out why. The DOS manual certainly doesn't make this one-character limit clear.

Daniel Schwartz
Bronx, New York



The FOR command can be a remarkable timesaver, and it isn't limited to lists of files. For example, you can repeat an operation a fixed number of times by using a FOR loop with that number of items:

```
FOR %v IN (x x x x x) DO ECHO Hey!
```

However, you can't directly run a batch file in a FOR loop, because the batch file doesn't return control to the FOR command. You have to use CALL or, if your DOS version doesn't support the CALL command, COMMAND /C.

Schwartz notes that DOS behaves as if a FOR command created an internal batch file. That's true to some extent, but FOR's list of files is dynamic, not static. If the action it performs creates more files that match, they too will be processed. To get a better idea of what I mean try this experiment. Create a file called X.X—the contents don't matter as long as it's not a zero-length file. Now give this command at the DOS prompt:

```
FOR %f IN (*.X) DO COPY %f X%f
```

The result may surprise you. This command will copy X.X to XX.X, XX.X to XXX.X, and so on, all the way to XXXXXXXX.X.

Because a FOR loop is in some ways like a batch file, you might hope to get around the prohibition on nested FOR loops by using CALL. Well, CALL won't do it, but COMMAND /C will! Suppose you want to run the program P.EXE, which takes two parameters. You wish to try the program with all combinations of A, B, or C as the first parameter and X, Y, or Z as the second. This grand DOS command does the job:

```
FOR %m IN (A B C) DO COMMAND /C
FOR %n IN (X Y Z) DO P %m %n
```

Once you get used to the idea that you can use FOR at the DOS prompt, you'll find it's amazingly useful!

EASIER PRINTER CONTROL

I realize that the ideas I'm about to present have probably been printed in your column before, but I think it's safe to assume that many of your new readers—and probably some of the older readers as well—could benefit from this repetition of

LF.BAT

COMPLETE LISTING

```
@ECHO OFF
REM This file will send up to 10 line feeds to the printer

REM This file requires a parameter, so test for %1
IF (%1)==( ) GOTO Syntax

REM Test %1 for a range of 1 to 10 and direct to proper batch line
FOR %v IN (1 2 3 4 5 6 7 8 9 10) DO IF %v==%1 GOTO Feed%1

REM IF %1 is not in the range 1 to 10
GOTO Syntax

:Feed10
ECHO {ALT-255} > PRN
:Feed9
ECHO {ALT-255} > PRN
:Feed8
ECHO {ALT-255} > PRN
:Feed7
ECHO {ALT-255} > PRN
:Feed6
ECHO {ALT-255} > PRN
:Feed5
ECHO {ALT-255} > PRN
:Feed4
ECHO {ALT-255} > PRN
:Feed3
ECHO {ALT-255} > PRN
:Feed2
ECHO {ALT-255} > PRN
:Feed1
ECHO {ALT-255} > PRN
GOTO END

:Syntax
ECHO LF.BAT syntax = LF NUMBER
ECHO
ECHO Where NUMBER is in the range 1 to 10
ECHO
:END
```



Figure 1: Replace {Alt-255} in the file above with ASCII character 255 to get a batch file that sends from one to ten line-feeds to your printer.

them. I've developed the following batch files to make my life in DOS a little more pleasant.

I've always hated having to take the printer off-line, eject the page, and then put the printer back on-line. It's a pain, even if the printer is right next to the computer. Instead, you can create FF.BAT:

```
@ECHO OFF
ECHO ^L > PRN
```

Then you can simply type FF at the DOS prompt, and your printer will eject the page. FF.BAT is especially useful if you use DOS redirection to print directories and files from the DOS prompt.

BEEP.BAT is another handy batch file:

```
@ECHO OFF
ECHO ^G
```

As its name suggests, it simply causes the computer to beep—a convenient and effective way to get a user's attention or remind him about something he needs to do, perhaps to change a disk while a batch file is running.

LF.BAT, shown in Figure 1, is useful when you're redirecting more than one directory listing to the printer. I use it to insert up to ten blank lines between listings. If you want to send five blank lines, use LF 5.

The line-feeds are created by ECHO-ing the character created by ALT 255 to the printer. Sending the actual LF character, ALT 10, doesn't work from within a batch file.

I hope you find these ideas useful. I've also written some programs in QuickBASIC to serve these same functions; however, the QuickBASIC files are in the size range of 40K each. Needless to say,

that's overkill compared with the little batch files that I've presented here.

Gary F. Colnar
Walsenburg, Colorado



FF.BAT and BEEP.BAT are extremely simple batch files, but you can make them even simpler if you use DOS 3.3 or later. Just eliminate the @ECHO OFF line and put an @ sign in front of the ECHO on the next line. Now that you've reduced these files to a single line each, you may wonder whether it's worth a cluster of disk space to store them or whether you'd be just as happy typing them at the DOS prompt when you want to use them. In any case, note that ^ signifies the Ctrl key.

LF.BAT is more interesting. There are many techniques for echoing a blank line to screen or printer, but using ASCII character 255 is the only one I've found that works for all versions of DOS. To create the ASCII character 255, hold down the Alt key, tap out 2 5 5 on the numeric keypad, and then release the Alt key. You won't see anything special; this character displays on the screen as a space. The batch file cleverly stacks the ten lines that send a blank line to the printer in such a way that the batch file can simply jump into the stack at the appropriate place to produce a particular number of line-feeds. Of course, this technique is less useful for laser printers, and in fact, some laser printers will interpret the Alt-255 character as something printable.

So the next time you give a print command like this:

```
DIR | SORT > PRN
```

don't get up to advance the paper afterwards. Either call FF.BAT or echo a Ctrl-L to the printer and watch the paper pop out. And don't get up to roll the paper forward between small listings—use LF.BAT to advance from one to ten lines.

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Languages

USING THE CORRECT MEMORY MODEL

If you haven't modified a program in a long time, and you didn't set the memory model with a Make or Project file, it's easy to forget what memory model you used. If you compile a program using the wrong memory model, most likely it won't compile. Or it may compile but then crash when you run it.

I've created a one-line piece of code that you can add to each project header or source code file that will prevent this problem. To implement this solution, create a small header file for each memory model. In each of these headers, include a line that checks for the existence of a macro that defines the memory model being used. For the Borland C and C++ compilers, this is `__TINY__` when the tiny memory model option is in effect, `__SMALL__` when compiling the small model, and so on. Next, `#include` the appropriate header file in each program's source file.

For instance, whenever you create or modify a program requiring the large memory model, add

```
#include<MODEL_L.H>
```

to each source file. After this, if you attempt to compile with an undesired memory model, you'll immediately see an error message. And when compilation is aborted, the illegal statement will be flagged as the

■ **USING THE CORRECT MEMORY MODEL:** Forgot which memory model you used to compile a program? Now you can know immediately whether you've chosen the wrong one.

■ **SWITCHING GRAPHICS MODES:** Turbo C++ and Borland C++ runtime libraries fix a bug in Turbo C and return the correct value for `getmaxx()`.

first error, reminding you of the corrective action that's required.

Jerry W. Olsen
Chicago, Illinois



This is a nifty and useful trick. I modified Olsen's header file slightly to use the ANSI `#error` directive to display the incorrect memory model error message. Figure 1 shows the revised small model header file.

To demonstrate how it works, I wrote a small test program, shown in Figure 2, that you can compile with *any* memory model—provided you change the `#include` directive to reference the appro-

prate header file. Without changing its source code, try compiling `MODEL.C` with the small model, and then recompile it with the large model. You'll find that unless you change the `#include` directive, you cannot successfully compile this program with any but the small memory model.—Richard Hale Shaw

SWITCHING GRAPHICS MODES

I've been writing programs that switch video modes using Turbo C's graphics functions and discovered that Turbo C 2.0's `getmaxx()` function doesn't perform as expected.

The manual states that "`getmaxx()` returns the maximum (screen-relative) x value for the current graphics driver and mode." My program switches between graphics modes using the CGA driver provided with Turbo C. When I switched

MODEL_S.H

```
// model_s.h RHS 3/4/91

// when #include'd in a .C or .CPP file, insures that only a particular
// memory model can be used: e.g., MODEL_S.H is for the Small model

#if !defined( __SMALL__ )
#error Small Memory Model not defined: set model option\
and re-start compile
#endif
```

Figure 1: To make sure you don't compile your programs with the wrong memory model, create small header files for each model that check for the existence of a macro defining the memory model being used. This is an example of a small-model header file.

MODEL.C

```
// model.c RHS 3/4/91

#include"model_s.h"

void main(void)
{
    char *model =
    #if defined( __TINY__ )
        "Tiny"
    #elif defined( __SMALL__ )
        "Small"
    #elif defined( __COMPACT__ )
        "Compact"
    #elif defined( __MEDIUM__ )
        "Medium"
    #elif defined( __LARGE__ )
        "Large"
    #elif defined( __HUGE__ )
        "Huge"
    #endif
    ;

    printf("Compiled via the"
           " %s memory model!",
           model);
}
```

Figure 2: This small program demonstrates how to add just one line of code to your Turbo C and Borland C++ programs and prevent wasting time compiling with the wrong memory model.



While you can use this approach with Turbo C, you're better off upgrading to Turbo C++ or Borland C++. As with most popular C compilers, subtle library bugs get fixed in subsequent upgrades. And with these two versions of Borland's C compiler, getmaxx() returns the correct value.

To test this, I wrote GETMAXX.C, shown in Figure 3, which can be run on a VGA system. (To run it on an EGA system, just remove the VGA entry in the **graphdrivers** array, and decrement the MAXDRIVERS macro to 2. For a CGA system, delete both the EGA and VGA references, and set MAXDRIVERS to 1.)

GETMAXX will attempt to load each graphics driver designated in the **graphdrivers** array (if it fails, it will print an error message, set the screen to text mode, and exit). Then the program will swing through each of the modes available for the loaded graphics driver and display the driver name, the graphics mode name, and the maximum x and y values. GETMAXX retrieves the range of graphics modes for the current driver via getmoderange(), and changes to the appropriate graphics mode via setgraphmode().

Use the following line to compile GETMAXX.C

BCCX getmaxx.c graphics.lib

with Borland C++. Substitute TCC for BCCX to compile with Turbo C++. Be sure either to include the appropriate graphics drivers in the current directory when you run the program or to modify the last parameter to initgraph() to contain the path to the BGI driver directory.

This example demonstrates that the bug you mentioned has been fixed in both the Borland C++ and Turbo C++ runtime libraries. So make sure that you upgrade: You owe it to yourself to use the latest version of any vendor's C compiler.

—Richard Hale Shaw

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GETMAXX.C

```
// getmaxx.c RES 3/4/91

#include<graphics.h>
#include<stdlib.h>
#include<stdio.h>
#include<conio.h>

#define MAXDRIVERS 3
int graphdrivers[MAXDRIVERS] = { CGA, EGA, VGA };
char *graphdrivernames[MAXDRIVERS] = { "CGA", "EGA", "VGA" };

void main(void)
{
    int graphmode = 0, i, j, low, high, err;
    int midx, midy, textx;
    char xrange[80], yrange[80], drivername[80];

    for(i = 0; i < MAXDRIVERS; i++)
    {
        initgraph(&graphdrivers[i], &graphmode, "");

        if(err = graphresult())
        {
            printf("Graphics error: %s\n", grapherrormsg(err));
            printf("Press any key to exit program...");
            getch();
            restorecrtmode();
            exit(1);
        }

        getmoderange(graphdrivers[i], &low, &high);

        for( j = 0; j < 2; low = high, j++)
        {
            setgraphmode(low);
            midx = getmaxx() / 2;
            midy = getmaxy() / 2;

            sprintf(drivername, "%s, mode: %s number: %d",
                graphdrivernames[i],
                getmodename(getgraphmode()),
                getgraphmode());
            sprintf(xrange, "X values range from %d to %d", getmaxx());
            sprintf(yrange, "Y values range from %d to %d", getmaxy());

            settextjustify(CENTER_TEXT, CENTER_TEXT);
            textx = textheight("W");
            outtextxy(midx, midy, drivername);
            outtextxy(midx, (midy += textx), xrange);
            outtextxy(midx, (midy += textx), yrange);
            getch();
        }

        closegraph();
    }
    exit(0);
}
```

Figure 3: Use GETMAXX.C to make sure that Getmaxx () returns the maximum x value for the current graphics driver and mode, not the mode in which the drive was initialized.

modes, I found that getmaxx() returns the maximum x value for the mode in which the driver was initialized, not for the current mode.

To solve this problem, I made use of the getmodename() function, which returns a pointer to the name of the current graphics mode. Since the name contains the screen resolution for that video mode (for

example, "640 x 200 CGA"), you can retrieve the correct x value, with the following line:

```
maxx = atoi
( getmodename(gmode) ) - 1;
```

Timothy D. Anderson
Bedford, Texas

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CIRCLE 211 ON READER SERVICE CARD

by
Jeff Prosise

Tutor

MORE ON LOW-LEVEL FORMATTING

In the January 29, 1991, Tutor column, you discussed the virtues of periodically low-level formatting a hard disk to ensure that sectors and sector ID marks remain in alignment and that sectors containing newly developed surface defects are properly marked. However, the manual that came with my Quantum IDE hard disk says that the drive should not be low-level formatted. Is this true? If so, are IDE disks less susceptible to alignment drift than other drives?

John M. Anning
Rock Falls, Illinois



The short answer is that IDE drives can be low-level formatted only at the factory, because they contain special analog signals (called *servos*) that help the drive heads precisely locate sectors and cylinders on the surface of a disk, and that IDE controllers lack the sophisticated electronics needed to create them. But this doesn't apply to all IDE disk drives, because not all IDE drives use servos. There are other impediments to low-level formatting that apply as well to different drive types. Knowing something about the history of IDE drives will help you understand these obstacles to low-level formatting.

While early-generation hard disks of all types relied on stepper motors, most IDE drives manufactured today use *voice coils* to move their heads. A voice coil provides infinite adjustability, because it moves the head mechanism by varying the current in a solenoid. By contrast, a *stepper motor* is a gear-driven device that moves in discrete steps in response to electrical pulses sent from a controller and is therefore subject to limitations on speed and precision.

Voice-coil actuators are typically more precise than stepper motors, in part because they receive positioning feedback from the drives themselves. When a voice coil is told to seek to a given track, it

- **MORE ON LOW-LEVEL FORMATTING:** Why some hard disks can't—or shouldn't—be low-level formatted.
- **INTERRUPTS AND EXCEPTIONS:** How programs and devices get the attention they need.

doesn't simply thrust the drive heads in or out a calculated distance and assume they're in the right place—as most stepper motor drives do. Instead, it uses servo information (electrical signals that help the controller adjust to small variations in track location) stored on the drive itself to zero in on individual tracks.

The upshot is that the precision of a voice-coil drive is independent of many of the physical constraints that affect the accuracy of stepper-motor drives. Even if its heads have drifted slightly or temperature variations cause the disk platters to expand or contract, a voice-coil drive will seek to the same place every time within a very small tolerance band. The only drawback is that the surface where servo data is stored can't be used to store other data. That's why some drives have an odd number of heads. A drive reporting seven heads probably has eight surfaces for storing data (four drive platters with two sides each), but the eighth is set aside for servo information.

Some drives don't locate the servo signals on a dedicated surface. Instead they place them inside the tracks themselves. Such drives are said to use *embedded servos*. Western Digital's Centaur-series hard disks were among the first to use this technology. Every track had a small servo (called a *wedge servo*) embedded in it that enabled the drive to make minute tracking adjustment at any

time. Drives like this offer two advantages. First, they're less vulnerable to errors resulting from different amounts of creep between drive heads, because each head gets feedback from the drive surface it's assigned to. Second, the platter that was formerly used to store servo information can now be used to store data.

Wedge servo drives *can* be low-level formatted. The controller takes care to skip over the servo information when it writes sector data to the disk, ensuring that the servo signals (which can't be written to the disk by conventional drive controllers) are preserved.

This step led to the latest development in embedded servo technology—placing servos at the beginning of every sector on the disk rather than just at the start of every track. This enhancement reduces the controller's sensitivity to variations within a given track and even allows it to compensate for small mechanical instabilities. Most new IDE drives use this technique. But there is one undesirable side effect—the drive can only be low-level formatted with a special controller. Drive manufacturers format these disks at the factory, because the controllers built into them can't write servos. Nor can they reliably determine where the servos are to skip over them. Hence the manufacturers' warnings that some IDE drives can not—or should not—be low-level formatted. Such drives can only be low-level formatted by special hardware.

According to Jim Ralph, Director of Technical Support at Gibson Research, makers of *SpinRite II*, attempting to low-level format an IDE drive of this type is rarely harmful. The controllers on these IDE drives generally respond to requests to format a track in a nondestructive way. For example, some controllers will go ahead and zero out the data fields within the sectors, but leave the sector headers untouched for fear of impinging on the servos. If the servo signals were inadvertently overwritten, the portions of the disk affected would become unreadable. The

Tutor

software performing the format may report that the disk was low-level formatted. In fact, it probably was not.

Placing a servo at the beginning of every sector of a disk isn't the latest in embedded servo technology, either. Some IDE drives contain servo information at the start of every sector and midway through the sector as well. These drives, too, can only be low-level formatted at the factory. The relationship between servos, sector headers, and sector data for both single and double-servo disks is illustrated in Figure 1. In a single-servo arrangement, the servo precedes the sector header (for more on sector headers and sector formats, see the March 12, 1991, Tutor column) and data area of the sector. In a double-servo arrangement, there is a second servo splitting the data portion of the sector into two halves. Fortunately, IDE drives that use embedded servos are fairly resistant to alignment drift, eliminating the need to reformat them to realign sectors and sector headers. Stepper motor drives benefit the most from a periodic low-level format to ensure that the sectors' data and header fields are aligned, because they rely on the accuracy of their motors for repeatability in positioning their heads.

There are other drive properties that impede low-level formatting, too, and not just on IDE drives. For example, many of today's drives employ some form of *sector*

translation, in which the apparent number of heads, sectors, and cylinders on the drive is adjusted for compatibility with the system the drive is installed in. Among other things, this allows hard disks with more than 1,024 cylinders to be used without device drivers (most hard disk BIOSes support a maximum of 1,024 cylinders). However, if sector translation can't be disabled, it's very difficult for low-level formatting software to determine the physical characteristics of a drive.

Zone-bit recording, an often-used

Even though you
can't reformat some
disks, it's still a
good idea to keep a
disk maintenance
utility on hand.

recording technique that varies the number of sectors per cylinder over the surface of a disk to keep the data density relatively constant, also forestalls low-level formatting.

Even though you can't reformat some drives, it's still a good idea to have a disk-maintenance utility like *SpinRite II* on

hand. *SpinRite* can't change the interleave on these disks, but it can perform most of the other normal functions. These include analyzing the disk for defective sectors and moving data out of the bad areas and into the good ones. In the end, it's your data that benefits.

INTERRUPTS AND EXCEPTIONS

What's the difference between a hardware and a software interrupt? And what is an interrupt anyway?

Randy Thornton
(via PC MagNet)



Interrupts are mechanisms for transferring control from one location in memory to another. When an interrupt occurs, the CPU temporarily stops what it's doing and executes a special routine known as an interrupt service routine (ISR). Then, when the ISR terminates, the CPU resumes execution at the point immediately following the instruction that was interrupted.

Interrupts are used on the PC in three different ways: by programs, to invoke software routines in the BIOS and in the DOS kernel; by hardware devices, to signal the CPU that they need attention; and by the CPU itself, to flag errors that result from the execution of certain instructions. These interrupts are called *software interrupts*, *hardware interrupts*, and *exceptions*, respectively.

When an interrupt or exception occurs, a prepatterned sequence of events ensues that allows the CPU to respond to the interrupt and later resume execution as if nothing had happened. This sequence of events is as follows:

- The *flags register*, an array of 1-bit signals containing processor status and control information, is pushed onto the stack so that it can be restored after interrupt processing is complete.
- The contents of the CS (Code Segment) and IP (Instruction Pointer) registers are pushed onto the stack, preserving the address at which the interrupt occurred.
- The interrupt flag (IF) in the flags register is cleared so that further interrupts are disabled. At this time, the trap flag (TF) is also cleared.
- The 32-bit address of an interrupt service routine (ISR) is fetched from the interrupt table in the lowest 1K of memory and execution is then transferred to that address.

The ISR performs whatever process-

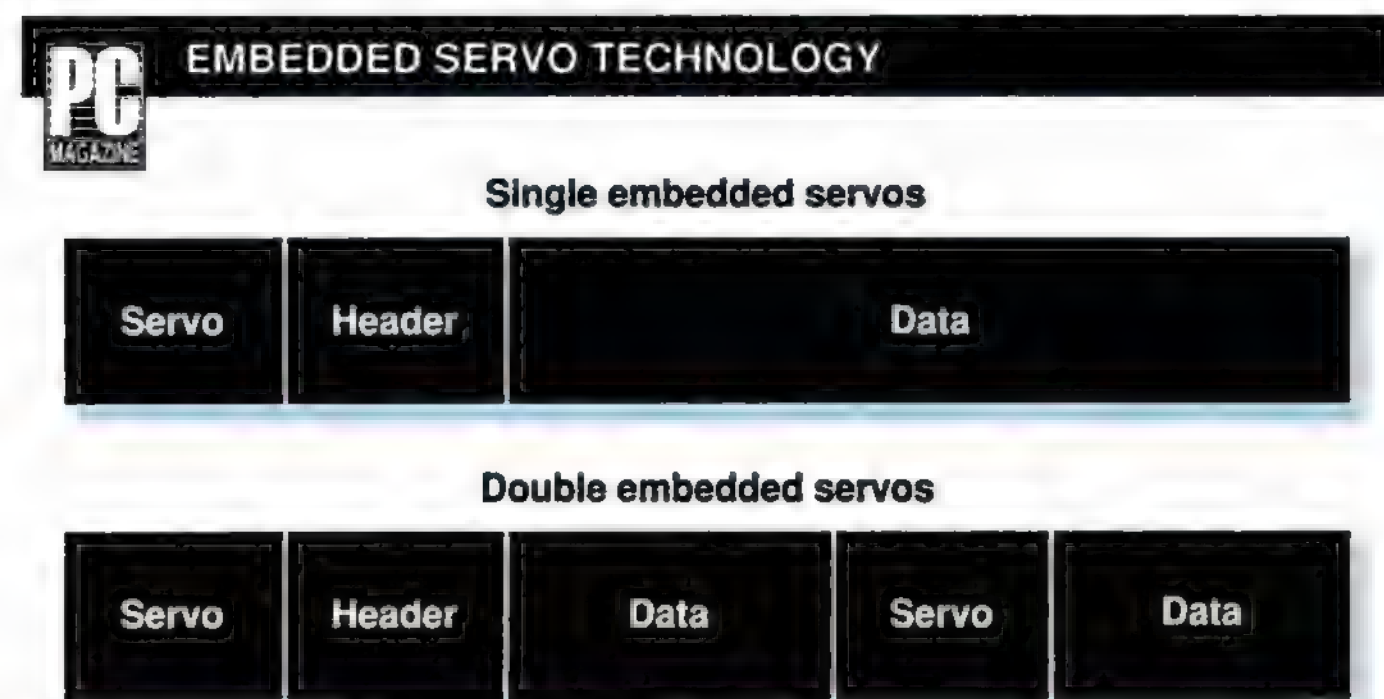


Figure 1: Modern IDE drives embed servo information within the tracks of a disk rather than on a separate disk surface. In a single servo arrangement, there is one servo mark at the start of each sector; it precedes the sector header and the sector's data field. In the double servo arrangement, there is one servo at the beginning of the sector and one in the middle of the data field. Drives that use embedded servos can be low-level formatted only at the factory.



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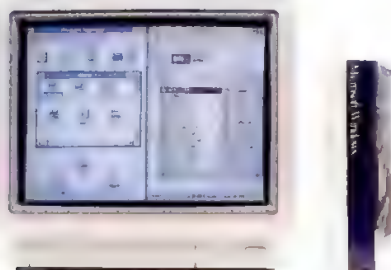
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ing is necessary to service the interrupt request.

■ When the interrupt handler executes an IRET (Interrupt RETurn) instruction, the contents of the CS, IP, and flags registers are retrieved from the stack and execution resumes where it left off.

It's up to the ISR to save the state of the system at the time the interrupt occurred and to restore it before it ends, so that the program that was interrupted is not affected. Generally, the ISR begins by saving on the stack any registers it may modify and finishes by popping these registers off the stack.

Every interrupt has a number associated with it ranging from 0 to 255. When an interrupt occurs, this number serves as an index into the *interrupt vector table* stored in low memory. This table holds the addresses of up to 256 different ISRs. This way, the system can support as many as 256 different interrupts. An interrupt 05h, for example, results in the execution of the ISR whose address is sixth in the vector table (sixth because interrupt 0 is the first). In real mode, this table is al-

ways stored at 0000:0000—the very first byte of memory. You can inspect the table for ISR addresses and examine individual ISRs with DEBUG.

A software interrupt is generated when a program executes an INT (INTerrupt) instruction. The myriad of programming services located in the BIOS and in the DOS kernel are accessed with INT, so it's not unusual for a single program to generate hundreds or perhaps thousands of software interrupts. A good example of a software interrupt is the one most programs use to read a key code from the keyboard buffer. The instructions

```
MOV AH, 0
INT 16H
```

invoke a BIOS routine that fetches from the keyboard buffer the next key code waiting to be read. The data is returned in the AX register.

There are two types of hardware interrupts: *maskable* and *nonmaskable*. A device generates a nonmaskable interrupt by activating the NMI pin on the CPU. Nonmaskable interrupts are so called because they get through, even if interrupts have been disabled with a CLI (Clear Interrupt) instruction. Maskable hardware interrupts, on the other hand, are shut off (masked) from the CPU when interrupts are disabled.

Maskable hardware interrupts are triggered when a device such as the keyboard, the system timer, or a serial port activates the CPU's INTR line. Typically, these devices aren't attached directly to the CPU, but to an interrupt controller, whose job it is to field interrupt requests from hardware sources, prioritize them, and pass them to the CPU one at a time. The output from the interrupt controller (generally an Intel 8259) is attached to the INTR line of the CPU.

A classic example of a hardware interrupt is what happens when a key is pressed on the PC's keyboard. Through the interrupt controller, an interrupt 09h is generated that executes an ISR in the BIOS. The ISR reads the key's scan code from the keyboard's data port, converts it into an ASCII equivalent, and stuffs both the scan code and the ASCII code into the keyboard buffer.

The last type of interrupt, the *exception*, is generated by the CPU itself when it detects an error condition during or after the execution of an instruction. For example, if a program attempts to divide

a number by zero, the CPU executes an interrupt 0. The nature of the exceptions that are recognized varies from CPU to CPU. Figure 2 lists the exceptions an 80386 recognizes.

Many of the exceptions are valid in protected mode only. If a program attempts to access memory outside the range the operating system has allocated it, for example, an exception 13 ensues. Operating systems such as OS/2 intercept such

It's up to the ISR to save the state of the system at the time the interrupt occurred and to restore it before it ends, so the program isn't affected.

exceptions and terminate the programs that cause them. When you get a "Divide overflow" error from DOS, it's because a program has attempted a divide-by-zero. DOS intercepts the exception and terminates the program rather than allowing it to proceed and possibly cause the system to crash.

Exceptions are divided into three different categories: *faults*, *traps*, and *aborts*. Figure 2 indicates which category each of the 80386's exceptions falls into. Faults result from errors encountered *during* the execution of an instruction, traps occur when errors are detected *after* the execution of an instruction, and aborts occur when the error is so severe that the location of the instruction that caused the exception cannot be determined.

ASK THE TUTOR

The Tutor solves practical problems and explains techniques for using your hardware and software more productively. Questions about DOS and systems in general are answered here. Send your question to Tutor, *PC Magazine*, One Park Avenue, New York, NY 10016, or upload it to PC MagNet (see page 8 for instructions). We regret that we cannot answer questions individually. ■

80386 EXCEPTIONS		
Number	Exception	Type
0	Divide error	Fault
1	Debug exception	Trap
2	Nonmaskable interrupt (NMI)	—
3	1-byte interrupt	Trap
4	Overflow interrupt	Trap
5	Array bounds check	Fault
6	Invalid opcode	Fault
7	Device not available	Fault
8	Double fault	Abort
9	Coprocessor segment overrun	Abort
10	Invalid TSS	Fault
11	Segment not present	Fault
12	Stack fault	Fault
13	General protection fault	Fault
14	Page fault	Fault
16	Coprocessor error	Fault

Figure 2: When an 80386 detects an invalid condition during or after the execution of an instruction, it generates a special class of interrupt known as an *exception*. The types of exceptions it recognizes are shown here. The 80486 added exception number 17, called the *alignment check interrupt*.

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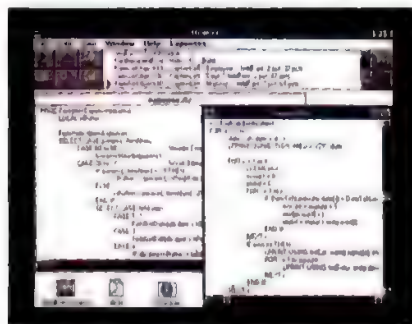
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by
Frank J. Derfler, Jr.

Connectivity

CHECKING PATCH CABLES

I recently saw a handy little box that anyone involved with unshielded twisted-pair wire, 10BaseT, or plain-old telephone service will find useful. Paladin Corp. (800-272-8665) makes a device called Patch Check that quickly tests RJ-45 and RJ-11 cables. You plug both ends of the cable into the device, push the button, and check to make sure the proper number of LEDs light up. The device works only on patch cables that you can access at both ends, but it nevertheless has many applications. Patch Check carries a retail price of \$49.95 and works with either eight or six wire connections.

FRAME RELAY TECHNOLOGY

Many of the weekly trade papers are writing about the popularity of something called *frame relay*, but none of them takes the time to explain it. What is frame relay and why is it so popular?

John Tucker
Reno, Nevada



Frame relay is a wide area networking technique that has created a lot of stir, but few sales so far. If you believe the predictions, frame relay will substantially displace X.25 and direct-leased-line networks in the coming years as the most popular way to carry data across cities, continents, and oceans.

The value-added networks—like Accunet, Tymnet, and Telenet—route packets of data from one point to another according to the CCITT X.25 standard. The X.25 architecture is good for “bursty” traffic like that coming from local area networks, but programs that follow this protocol must do a lot of work to ensure the delivery of data across the network. As a result, X.25 systems have a lot of processing overhead and can experience delays that show up in a reduction in total system throughput.

The competing technique, time-division multiplexing, uses special devices (multiplexers) to pack the data from many

- **CHECKING PATCH CABLES:** Here's a handy device that quickly tests RJ-45 and RJ-11 cables.
- **FRAME RELAY TECHNOLOGY:** A new wide area networking technique for making LAN-to-LAN connections.
- **PROTECTING YOUR DATA:** Here are a couple of ideas for dealing with electrical surges.
- **NOVELL'S MENU SYSTEM REVISITED:** Another way to get @ counters to work correctly.
- **WIRING FOR THE FUTURE:** A home-automation system that anticipates future connectivity needs.

computers into a single communications line. Multiplexing is a very orderly process with low overhead, but it isn't efficient for bursty network traffic; it's much better with a heavy data flow.

Frame relay technology takes advantage of two factors, today's powerful computers and higher-quality connecting circuits, to create a low-overhead wide area networking system that is efficient for the bursty traffic generated on LANs.

Many of the frame relay specifications still don't have final approval, but the idea is to reduce overhead by assuming that most data packets will successfully traverse the network. If a packet is somehow damaged or dropped, the architecture puts the responsibility for retrans-

mission on the transmitting device instead of trying to perform error detection and correction tasks on-the-fly inside the network. For this reason, frame relay networks aren't appropriate for moving data that can't accept a delay, like graphics or digitized voice, but they're just dandy for LAN-to-LAN connections.

A company called Netrix sells a 67-page booklet called “The Buyer's Guide to Frame Relay Networking.” It's packed with easy to follow descriptions and practical advice and costs \$7.95. Call 703-742-6000 for more information.

PROTECTING YOUR DATA

We live in a dry climate and have to put up with a lot of static electricity. One of the problems we run into is that our Ethernet network adapters fail when someone touches a PC and discharges to the chassis. Also, we seem to have network failures that coincide with powerline failures, even when everything is protected by a UPS. Do you have any solutions to these problems?

Polly Seafer
Salt Lake City, Utah



The IEEE 802.3 specifications contain extensive descriptions of the surge-suppression requirements for Ethernet adapters. However, some companies use older technologies, components can degrade, and some boards might not have been stringently designed in the first place. And while designs that implement the Ethernet specifications will limit surges that might cause physical damage, they are less effective at preventing currents that disrupt data.

There are a couple of other factors you need to consider as well. First, some UPS systems don't include surge protection. By definition, a UPS reacts to longer-term abnormal voltage conditions, rather than to spikes and pulses. All of the UPS systems we've seen in the PC Magazine LAN Labs do have surge protection, but it's not a guaranteed part of a UPS.

Connectivity

Second, some studies (particularly one published by the National Bureau of Standards in 1988) show that when the typical surge protector shunts a surge to ground, a surge of lesser but still potent magnitude can appear between the chassis of the PC and the LAN cable. This can be an even bigger problem with serial and parallel cables that connect directly to the chassis of the PC. The folks at Zero Surge Inc. make the effect of this voltage dumped to ground one of their primary marketing arguments.

The surge-protection devices from Zero Surge store the surge energy in inductors and capacitors and gradually release it to the neutral wire of the AC powerline instead of dumping it to ground. They also avoid using metal oxide varistors (MOVs), because these degrade over time. A Zero Surge unit with a 7.5 amp capability costs \$149. If you're interested, contact Zero Surge at 908-766-4220.

You should also consider protecting the LAN cable with surge protectors like those sold by Patton Electronics, available for both thin Ethernet and 10BaseT unshielded twisted-pair wiring. These devices use silicon avalanche diodes that don't deteriorate like MOVs. They cost around \$50 and go right in line in the Ethernet cable. They start clamping voltages at 14 volts, so they'll get rid of even low voltages that can garble data. You can contact Patton Electronics Company at 301-975-1000.

NOVELL'S MENU SYSTEM REVISITED

I regularly read your column and enjoy each installment. This letter is in reference to the item, "Improving Novell's Menu System" from the March 26, 1991, issue.

The author of that item mentioned the problem of using @ counters with the SEND command. These counters can be used to store values while Novell's menu is executing, but their format requires that they be followed by a message in quotes—and SEND unfortunately strips the quotes from the first @ counter. He suggested using environment variables to overcome the problem.

I've discovered a simpler method for dealing with it. Rather than setting the @ variables to environment variables, you can place the whole command in quotes.

So instead of using the form

```
SEND @1"Enter Message" @2"To  
UserName or GroupName"
```

you'd enter the command like this:

```
SEND "@1 "Enter Message" " @2"To  
UserName or GroupName"
```

In this way, you can send messages despite the action of *NetWare* to strip away the quotes, without cluttering up your environment space.

Stephen Fleming
Marshall, North Carolina



This is an excellent solution to the problem. Fleming's letter was the first we received on this topic, but by no means the last. Several readers described the use of "sacrificial" quotation marks in the menu syntax.

The Novell menu system seems to be a popular topic for our readers, many of whom are interested in customizing it for their particular environment. Does anyone else have hints for improving the Novell menu system?

WIRING FOR THE FUTURE

In your February 12, 1991, column, a reader asked about wiring for intelligent housing. In your response, you invited comment from anyone involved in Smart House systems. Smart House L.P. (Limited Partnership) is a consortium of 24 manufacturers, service providers, and builders developing a home-automation system we call the Smart House system.

Our goal is to develop an infrastructure for homes that anticipates the future connectivity needs of computers, intelligent devices, and other systems. We've redesigned the basic wiring and gas plumbing systems to be incorporated into new houses, and by the end of 1992 we'll have completed some 14,000 installations.

If your readers are interested in more information about Smart House systems, they can call 301-249-6000.

Charles E. Gutenson
Upper Marlboro, Maryland



The Smart House system includes ways to link air conditioners, gas grills, audio systems, video systems, and telephone systems to computers and other devices.

Three kinds of special cables form the basis of the Smart House wiring plan. The

applications cable distributes control communications and 12-volt DC for low-voltage products such as switches, smoke detectors, and security systems.

The hybrid branch cable distributes 120-volt power and relays special control messages among Smart House outlets. These special messages control lighting, among other things. Power-surge protection is built right into the total system.

The communications cable distributes audio, video, and telephone signals. The wiring topology is a branching star, with one central service center for each house. Two coaxial cables carry video and audio signals; cables run from the central point to one-to-four splitters that move the audio and video out to a total of 32 telecommunications or coaxial outlets from one central service center. The goal is to provide whole-house cable television service and telephone access from several points in every room of the house.

An interesting aspect of the Smart House system is a Telephone Gateway developed by AT&T that allows homeowners to check the status of the system from any pushbutton telephone. This device includes a modem, built-in answering service, and other communications features.

The literature for the Smart House makes no mention of integrating PCs into the system. There would seem to be great potential for a PC to run and monitor everything, but interfaces for a PC don't seem to be in place, and none of the companies in the consortium, with the possible exception of AT&T, have much interest in PCs. Certainly a technically inclined person who is building or rewiring a house will want to consider Smart House wiring. The system might not be PC-ready yet, but it seems like the most practical way to achieve the total home environment control and reporting structure many of us have daydreamed about for a long time.

NETWORK YOUR QUESTIONS

Connectivity gives you practical solutions to networking problems of all types. We'll pay \$50 for any tip we print. Please mail your letter on-disk along with a printout to Connectivity, *PC Magazine*, One Park Avenue, New York, NY 10016, or you may contact Frank J. Derfler, Jr., via MCI Mail (be sure to use Derfler's box named PC MAGAZINE LAN LABS). We are unable to answer letters individually. ■



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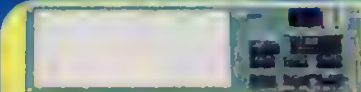
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- ✓ Clock calendar, parallel port, two serial ports, and game port.
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VGA 1024	\$1,669	\$1,799	\$1,889	\$2,149



FastData 486/25

Call about our hot 486, just \$2,999 with 4mb RAM Super VGA & 100mb drive. Includes a 128K two-stage cache and is expandable to 64mb of memory.

All FastData Systems Include:

- 30 day money-back guarantee
- Toll-free technical support for life
- One year warranty with on-site service available to most U.S. locations

FastData SX Systems



\$1599 FastData SX/20

25% faster than a 16mhz SX, the FastData SX/20 adds even greater performance to its 386 multitasking capabilities. Just \$200 more than our SX/16, this machine also includes an 80mb hard drive in addition to the super VGA color monitor and 16 bit VGA adaptor, Keytronics keyboard, DOS 4.01 or 5.0, and two floppy drives. The system includes two megabytes of memory and is expandable to eight on the main system board. Remember, when you have questions, need to solve a problem, or want recommendations on products for your system, the FastMicro team is standing by toll-free to provide product support for as long as you own your FastData personal computer.

Standard Features

- ✓ 20mhz Intel 80386-SX processor.
- ✓ 2 megabytes of high speed RAM.
- ✓ 80 mb 20ms IDE hard disk, 1:1 interleave.
- ✓ 1.2mb 5.25" and 1.44mb 3.5" floppy drives.
- ✓ Standard chassis (shown) with keylock, speed and reset buttons.
- ✓ 200 watt power supply
- ✓ 14" Super VGA color monitor with 16 bit VGA card with 512K.
- ✓ Clock calendar, parallel port, two serial ports, and game port.
- ✓ Keytronics 101 key keyboard.
- ✓ 8 expansion slots, 5 drive bays.
- ✓ 80387-SX coprocessor socket.
- ✓ Full Shadow RAM and LIM 4.0 EMS support.
- ✓ Windows & Mouse add \$99.
- ✓ MS-DOS 4.01 or 5.0.
- ✓ FCC Class B approved.

SX/20	40mb	80mb	100mb	200mb
Mono	\$1,169	\$1,299	\$1,389	\$1,649
VGA White	\$1,269	\$1,399	\$1,489	\$1,749
VGA Color	\$1,419	\$1,549	\$1,639	\$1,899
VGA 1024	\$1,469	\$1,599	\$1,689	\$1,949



\$1399 FastData 386/SX

Combine the benefits of an advanced Intel 386 processor, the value of a 286 and the advantages of FastData and you've got the FastData 386/SX! This machine is the choice of those who want to run today's powerful 386 and multitasking software, like Windows, and also want to run their favorite DOS applications at surprising speeds. We've made our customers' favorite options standard: it comes with an ample two megabytes of memory, a high performance 40mb hard drive, and 16 bit super VGA. Compare performance, features, and service and you will find no better SX value. Interested further? Try the FastData 386/SX for 30 days; you have to be happy - if not, we'll take it back.

Standard Features

- ✓ 16mhz Intel 80386-SX processor.
- ✓ 2 megabytes of high speed RAM.
- ✓ 40 mb 28ms IDE hard disk, 1:1 interleave.
- ✓ 1.2mb 5.25" and 1.44mb 3.5" floppy drives.
- ✓ Standard chassis with keylock, speed and reset buttons (mini desktop shown - add \$50).
- ✓ 200 watt power supply
- ✓ 14" Super VGA color monitor with 16 bit VGA card with 512K.
- ✓ Clock calendar, parallel port, two serial ports, and a game port.
- ✓ Keytronics 101 key keyboard.
- ✓ 8 expansion slots, 5 drive bays.
- ✓ 80387-SX coprocessor socket.
- ✓ Full Shadow RAM and LIM 4.0 EMS support.
- ✓ Windows & Mouse add \$99.
- ✓ MS-DOS 4.01 or 5.0.
- ✓ FCC Class B approved.

386/SX	40mb	80mb	100mb	200mb
Mono	\$1,099	\$1,229	\$1,319	\$1,579
VGA White	\$1,199	\$1,329	\$1,419	\$1,679
VGA Color	\$1,349	\$1,479	\$1,569	\$1,829
VGA 1024	\$1,399	\$1,529	\$1,619	\$1,879

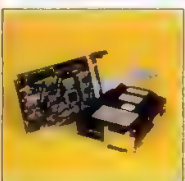
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1-800-441-FAST

DISK DRIVES

Colorado DJ-10 40-120mb Int. Tape	239
DJ-20 80-240mb Int. Tape	299
Conner (see FastData IDE controllers at right)	
CP3044 40mb IDE 28ms	239
CP3104 100mb IDE 25ms	399
CP3208 200mb IDE 25ms	599



Seagate 89mb AT Kit \$349

IDE performance, big 89 megabyte capacity and Seagate quality make this kit a great buy. A Plus access time and 5 mbps transfer rate assure great performance. Controller cables and rails are included to make installation fast and easy.

Irwin SX Int. Tape 40-120mb / 80-250mb	249/349
SX Ext. Tape 40-120mb / 80-250mb	399/499

Microplus

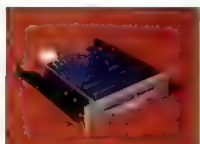
MC1664 240mb ESDI 14ms	1295
MC1598 1.2gb SCSI 14ms	2695

Plus Development

HardCard IXL 50 - 52mb 9 ms 16bit	399
HardCard IXL 105 - 105mb 9 ms 16bit	579

Toshiba 1.44mb Floppy Drive \$59

Complete with mounting brackets and installation instructions, this Toshiba works in all true 286 & 386 compatibles. Will also read/write/format 720K 3.5" disks. Rails, add \$5.



Seagate

30MB XT Kit ST238 w/ cont.	249
40MB AT ST251-1 MFM Drive	229
40MB AT ST157A 28ms IDE Drive	199
80MB AT ST296N SCSI Drive w/adaptor	319
89MB ST1102A 19ms IDE Drive	309
125MB ST1144A 19ms IDE Drive	399
210MB ST1239A 15ms IDE Drive	699
330MB ST2363E 16ms ESDI Drive	1199
Sun Moon Star Ext. CD-ROM Drive Kit	499

Teac

1.2MB 5.25" Floppy	65
1.44MB 3.5" Floppy	65



Toshiba 100mb IDE Kit \$439

Upgrade your 286 or 386 to IDE technology and Toshiba quality at a FastMicro price. This kit comes with a fast 20ms 105mb drive and built-in 1.1 controller, 16 bit IDE card with dual floppy controller and cables, 5.25" brackets and rails.

Toshiba

360K 5.25" Floppy (Black)	59
1.2MB 5.25" Floppy	59
1.44MB 3.5" Floppy	59
65mb MK134 22ms RLL drive	279
100mb MK234FCH IDE 3.5" drive	399
Western Digital	
WD93044 40mb IDE 28ms	199
WDAC280 80mb IDE 20ms	299
WDAP4200 200mb IDE 20ms	649
WE1007V-SE2 ESDI AT 1:1 dual controller	149

Sony CD-ROM Drive \$379

Unfathomable CD-ROM technology is here! This player reads over 4000 titles from just one CD and can even play your favorite audio CDs. This internal unit works in 286 thru 486 PCs regardless of hard drive type and comes with cable & interface. Add an Encyclopedia Book of Mammals or game CD for \$49 each.



BOARDS

Artisoft/Lantastic

Lantastic 2mbps Starter Kit - Two Station	349
Lantastic 2mbps Adaptor	139
Lantastic Ethernet Starter Kit - Two Station	499
Lantastic Ethernet Adaptor	209
ATI	
2400 ETC Internal	165
2400 ETC External	187
9600/E External MNP V.42bis	469



Sound Blaster \$149

Sound Blaster does for sound what VGA does for graphics! Supported by the largest software library, Sound Blaster makes your games come to life. Also includes a music synthesizer, voice input and sound compression, and MIDI interface. SB Talker even converts text into spoken English. Includes a game port also.

VGA Basic 16	75
VGA Wonder + 256K	159
VGA Wonder + 512K	189
Brown Wagh Sound Blaster	149

Everex

2400B Int Modem	69
EGA 480 Card	69
RAM3000 16 bit - w/ OK, add \$60/mb max 3mb	75
RAM8000 16 bit - w/ OK add \$60/mb max 8mb	169

Hayes

JT FAX 4800B Internal	139
Personal Modem 2400 w/Prodigy	119
Hercules Graphic Card +	169

Intel

Classic 2400 Modem Int. / Ext	139 / 169
Satisfaxion Classic - Internal 9600	379
8087-2	115
287XL	199
387-DX25 / 33	479 / 569
387-SX16 / 20	319 / 349

Logitech

ScanMan Plus	165
ScanMan 256	279

Orchid

ProDesigner II 512/1mb	279 / 329
Tiny Turbo 286	207
Tiny Turbo Xtra	269

Practical Peripherals P9600ISA \$449

This external modem features V.42 and MNP error correction combined with MNP5 and V.42 bis data compression to provide total high speed throughput. The P9600ISA is also V.32 ICM, V.32 V.22 compliant and comes with a five year warranty.



Paradise

Basic VGA - 8 bit	99
VGA 1024 256K/512K	149/179

Practical Peripherals

2400B Int Modem	125
2400B Int with MNP	159
PM9600ISA Ext V.32/V.42bis	449

Prometheus

Promodem 2400B Internal	99
Promodem 2400G Ext / Pocket Ext	149 / 119

USRobotics

2400 Sportster Int / Ext	119 / 135
2400 Sportster MNP Int / Ext	159 / 189
Courier HST 14,400 Int / Ext	539 / 579
Courier HST 14,400 Dual Standard Ext	839

Video 7

VGA 1024i 256K	159
VGA 1024i 512K	189
V-RAM II VGA 512K	339

ZOOM

HC2400 Internal	69
2400 V.42bis External Modem	159
9624 Send/Receive Internal Fax Modem	129

MONITORS

Mitsubishi 1410 EGA	325
Diamond Scan 1381	499
NEC	
Multisync 2a	469
Multisync GS 2a	199
Multisync 3d	629
Multisync 4d	Call
Panasonic C1381 VGA	399
Seiko CM1440 / 1450	499 / 639
Sony 1304 Multiscan	669
Zenith 1492	599

FastData Products

FastData 16 Bit VGA

The FastData 16 bit VGA card features 256K of video memory, does CGA, EGA, & VGA up to 1024x768 and comes with drivers for popular software including Windows 3.0. It's expandable to 512K and has a 30 day money-back guarantee.



FastData 16bit 1mb VGA	139
FastData CGA Card	35
FastData MGP Card	29
FastData Parallel/Dual Serial/Game Card	29

FastData 2400 Baud Internal Modem

The FastData 2400 baud internal modem is truly fly-compatable and can be configured to COM port 1-4. It has an internal speaker, is auto answer & auto dial and comes with a money-back guarantee.



9600B SendFax w/ 2400B Modem	99
9600B Send/Receive Fax w/2400B	119
MFM 16 Bit 1:1 Hard/Floppy Disk Cont.	59
RLL 16bit 1:1 Hard/Floppy Disk Cont.	69
XT 1.44 Dual Floppy Controller	35

FastData Monitors

Your best value, guaranteed! We have a full line manufactured for us by manufacturers like Hyundai and Matsushita (Panasonic). As with all FastData branded product, you get a full 30-day money back satisfaction guarantee. Shown is the VGA color.



FastData Monitors

14" Amber or White Monochrome	99
14" White VGA Monochrome	119
14" CGA Color .52 dot pitch	199
14" VGA Color .31 dot pitch	279
14" Super VGA 1024 x 768, 28 dp	319
14" Non-Int VGA 1024 x 768, 28 dp	429

PRINTERS

Canon BJ10E	319
BJ300 / BJ330	459 / 599
Citizen	
200GX	189
GSX140 / GSX145	285 / 395
Fujitsu DL3400	359



Citizen GSX-140 \$285

Loaded with features this 24 pin printer is a hot seller! It comes with 6 resident fonts, paper parking, and Epson & IBM printing modes. It does up to 192 CPS and has a unique LCD control panel that lets you set everything without DIP switches. Upgrade to color anytime for just \$49.

NEC	
P3200	269
P3300	369
P6200 / 6300	469 / 629
OKIDATA Okilaser 400	
669	
Panasonic	
KXP1180	155
KXP1123	239
KXP1124i	299
KXP1624	379
KXP4420 Laser	829
KXP4450i / 4455 Lasers	1299 / Call

NEC Silentwriter 2 Model 90 \$1595

PC Magazine's editor's choice! It comes with 2mb of memory, Postscript by Adobe with 35 fonts, and parallel serial and AppleTalk interfaces. All this and 6 ppm speed, an easy-to-use LCD operator panel and letter, legal, & envelope feed.



Seiko Smart Label Printer	
167	
Star	
NX1001	149
NX1500	299
NX2410 / 2415	249 / 369
NX2410 / 2415	419 / 539
Texas Instruments Microlaser PS17	
1199	
Microlaser PS35	
1499	

FastData 286/12 \$749

Imagine a fast 286 computer at a super price and you've got the FastData 286/12. This system is complete, not stripped. You get one megabyte of zero-wait-state memory and a 28ms IDE hard disk - standard. Also included is an amber monitor and graphics card, your choice of a high density 1.2mb or 1.44mb floppy drive and a Keytronics keyboard. And since it's a FastData, you are backed with toll-free technical support, one year warranty with the FastShip replacement program & on-site service plan, and our 30 day full money back satisfaction guarantee!

- ✓ 12mhz 80286 processor.
- ✓ 1 megabyte RAM.
- ✓ 40 mb 28ms IDE hard disk 1:1 interleave.
- ✓ 1.2mb 5.25" or 1.44mb 3.5" floppy drive (2nd drive add \$59)
- ✓ Standard chassis
- ✓ Five drive bays.
- ✓ 200 watt power supply.
- ✓ Math coprocessor socket
- ✓ Monochrome monitor with monochrome graphic board.
- ✓ Clock calendar, parallel port, game port, & 2 serial ports.
- ✓ Keytronics enhanced 101 keyboard.
- ✓ 8 expansion slots, 6 available.
- ✓ MS-DOS 4.01 or 5.0.
- ✓ Full documentation.
- ✓ FCC Class B approved.



	40 INT	80 INT	100 INT	200 INT
286/12				
Monitor	N/A	N/A	N/A	N/A
VGA White	N/A	N/A	N/A	N/A
VGA Color	N/A	N/A	N/A	N/A
VGA 1024	N/A	N/A	N/A	N/A

DATABASE & FORMS

askSam 5.0	209
Avery List & Mail Plus	37
Clarion Personal Developer	45
Clarion Professional Developer	449
Clipper 5.0	489
DataEase	459
dBase III+	439
dBase IV	479
dBXL Diamond	129
Formbase	299
FormTool Gold	52
Formfiller	85
Foxbase Plus	179
FoxPro	419
Paradox 3.5	489
Per:Form Designer & Filler	89
Personal Rbase	79
Q & A	214
RapidFile	99
Rbase for DOS	447
Reflex	159

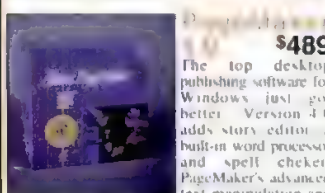
GeoWorks Ensemble \$115

GeoWorks is the entry-level graphical environment that's received rave reviews. Includes GeoWrite word processor & desktop publisher. GeoDraw object-oriented drawing package, and GeoComm communications package. Also comes with GeoManager, GeoPlanner, and GeoDev applications. Plus all programs operate with the same point & click simplicity mouse required.



DESKTOP PUBLISHING

Adobe Postscript Cart. for HPLJ-II	299
Adobe TypeSet 1 or 2	57
db Publisher Professional	389
Express Publisher	Call
Pagemaker 4.0	489
PFS First Publisher	89



\$489

The top desktop publishing software for Windows just got better. Version 4.0 adds story editor, a built-in word processor and spell checker. Pagemaker's advanced text manipulation and color design tools gives your publications a professional look. New Table Editor lets you create dynamically linked tables and graphics can flow automatically with text. Also includes Adobe Type Manager for Windows as a bonus.

Printshop	33
Publisher's Paintbrush	149
Publish III	129
Ventura Publisher Gold / Windows	519

FINANCIAL

ACCPAC BPI Value Pak	359
Bedford Integrated Acct	119
DAC Accounting 4.1	79
DAC Bonus Pack 4.1	119
DAC Payroll 4.1	57

Accounting \$349

for Windows
BeachTree brings integrated accounting to Windows. Crystal Accounting takes advantage of Windows ease and multitasking power. It includes General Ledger, Accounts Payable, Accounts Receivable & Invoicing, and Payroll. Its financial report writer lets you generate customized financial statements and reports and its data exchange feature lets it data work with other Windows applications.



Dollars & Sense	55
Managing Your Money	125
Money Matters	49
One Write Plus G/L, A/P & A/R	165
Pacioli 2000	35
Peachtree Complete III	139
Peachtree with Data Query	209
Quicken	36
The Manager's Organizer	139
Timeslips III	179
Wealth Builder	95

GRAPHICS

3-D Charts to Go for Windows	55
Autosketch 3.0	139
Corel Draw 2.0	359
Design CADD 3-D	185
DrawPerfect	259
Freelance Graphics 4.0	299
Generic 3D Drafting	199
Generic Cadd Level 2 Starter Kit	89
Generic Cadd 5.0	279
Harvard Graphics	299
PC Paintbrush IV Plus	109
Perspective Jr	69
PFS First Graphics	89



Freelance Graphics for DOS \$299

Lotus's newest version of its award winning graphics program. With its new Smart Features, Freelance Graphics will automate the process of turning your ideas into persuasive presentations. Includes text chart outliner, auto-charting, Smart Chart Update and more. Plus, call us today and you can upgrade from your eligible graphics software for only \$99!



INTEGRATED

First Choice	95
Framework XE	95
Geoworks Ensemble	115
LotusWorks	89
SmartWare II	417
Symphony 2.2	489
Works	89

MICE/INPUT

Keytronics KB101 Keyboard	59
Keytronics Professional Mouse	59
Logitech Mouseman Serial nighthand	65
Logitech Mouseman Serial w/Windows 127	
Logitech Mouseman Bus nighthand	76



Logitech MouseMan Serial \$65

Logitech's MouseMan is the next step in mouse evolution. Specifically tailored in right or left hand versions, it provides maximum comfort and 400 DPI hardware resolution. Includes MouseWare utilities and Lifetime Warranty. Specify right or left, for PaintShow add \$15.

Logitech Mouseman Cordless	129
Logitech Trackman Serial	75
Microsoft Serial or Bus Mouse only	83
Microsoft Serial or Bus w/ paint	95
Microsoft with Windows 3.0	147
Z-Nix Serial Mouse w/Windows 3.0	89

PROGRAMMING

Macro Assembler	95
Microsoft C Compiler	303
Borland C++	299
Borland ObjectVision for Windows	89
Turbo Pascal Dos/Windows	90/159
Quick Basic	60
Quick C	60
Quick Pascal	60
Windows Developer's Kit	309

SPREADSHEETS

Allways	115
Excel for Windows	299
Lotus 1-2-3 version 2.2	325
Lotus 1-2-3 version 3.1	399
Lucid 3-D	53
Quattro Pro 3.0 Upgrade	119
Supercalc 5D	89

Excel 3.0 for Windows \$299

The best graphical spreadsheet now includes Toolbar which puts frequently used commands at a single mouse click away. New Q + E lets you access remote databases & Best Fit automatically resizes columns to display longer cell widths. Charts, clip art support, and button macros are included too! Command level on screen help for transitional 1-2-3 users is included too.



WORD PROCESSORS

Facelift for WordPerfect	57
Grammatik IV	55
LetterPerfect	119
Multimate 4.0	267
Professional Write	159
Publisher's PowerPak / WordPerfect	call
Rightwriter	55

WordPerfect 5.1 \$239

WordPerfect is the #1 rated word processing software. It's got almost every feature imaginable and yet it is easy to use. The current version adds pull-down menus, mouse support, table creation and equation editor. Add this to the best software support in the business and you can't go wrong!

Sprint	117
Word	209
Word for Windows	299
Word Perfect 5.1	239
Word Perfect for Windows	269
Word Perfect Add'l Station	153
Word Perfect Office	89
WordStar Professional	Call
Writer's Toolkit	79

WINDOWS SOFTWARE

Adobe Illustrator	279
Adobe Type Manager	59
Adobe Type Manager Plus Pack	115
After Dark for Windows	25
Ami	115
Ami Professional	287
Asymetrix Toolbook	279
Bitstream Facelift	57
Corel Draw 2.0	359
DBlast/Windows	239

Microsoft Office \$447

This special bundle includes the leading Windows applications, Excel, Word and PowerPoint all in one. Excel is the top rated graphical spreadsheet. Word is the best Windows word processor and PowerPoint is the top presentation package. Act now and you will save half the cost of purchased separately.

Excel	299
Form Publisher	139
Grammatik IV for Windows	55
HDC First Apps or Windows Express	46
Micrographix Draw +	149
Micrographix Designer	449
MicroPhone II	199
Microsoft Mouse w/ Windows 3.0	147
Microsoft Office (Word/Excel/Powerpoint)	39
Microsoft Productivity Pack	309
Microsoft Windows Developer's Kit	309
Pagemaker 4.0	489
Per Form Pro	289
PFS WindowWorks	109
Powerpoint for Windows	309
Project for Windows	429
Publisher's Powerpak for Windows	45
Windows 3.0	89
Windows Entertainment Pack	27
Word for Windows	299

Adobe Type Manager & TypeAlign \$119 for both

Adobe Type Manager for Windows brings scalable PostScript fonts to your screen and non-Postscript dot matrix or laser printer. Includes Times, Helvetica, Courier and Symbol font families. New Adobe TypeAlign for Windows works with ATM to create curved, skewed and other special type effects which you can import into other Windows applications.

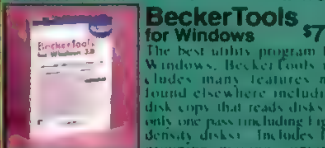


ENTERTAINMENT

Bannermania	21
Carmen SanDiego Deluxe Edition	45
F-19 Stealth Fighter	38
Hunt for Red October	19
King's Quest 5 (VGA Vers.)	35
Leisure Suit Larry II or III	35
Microsoft Flight Simulator	38
Aircraft & Scenery Designer	27
PC Globe or PC USA	35
Simcity	28
SimEarth	39
Ultima VI: The False Prophet	39
Wing Commander I / II	39 45

Utility Software

Address Book Plus	45
Calendar Creator Plus	39
Central Point Backup	57
Checkit	79



BeckerTools for Windows \$77

The best utility program for Windows, BeckerTools includes many features not found elsewhere including disk copy that reads disks in only one pass including high density disks. Includes file grouping, moving, copying, directory editing, file editing and text editor. Also includes undelete, pack and unpack, screen blanker too much more to list. All this with Windows point and click simplicity too!

Company Ladder	45
Control Room	69
CoreFast	60
Carbon Copy Plus w/Host	105
Desqview	75
Desqview 386	125
Direct Access	57
Disk Manager Dos / Novell	36 / 95
Disk Optimizer	37
DR DOS 5.0	129
GoScript 3.0	89
Fastback Plus	109

Stacker \$69

Stacker doubles the capacity of your hard disk in minutes, without reformatting. It compresses files in the background transparently giving you the extra room you need. For higher performance, Stacker software with compressor card (\$139) is an easily installable hardware solution which gives your hard disk a new lease on life.



Headroom	59
InfoSpotter	45
Labels Unlimited	45
Laplink III	85
Mace Utilities 1990	88
Mace Vaccine	59
Microsoft Learning DOS	32
MS-DOS 5.0	69
Norton AntiVirus	79
Norton Backup	90
Norton Commander	90
Norton Utilities 5.0	109
PC Anywhere IV	95
PC Tools Deluxe 7.0	99
Personal Lawyer	34
P.D. Queue	55

Central Point Anti-Virus \$77

Anti-Virus is the best way to keep your programs and data from being destroyed by deadly viruses. It recognizes over 400 known viruses and even detects unknown ones. Anti-Virus can also remove viruses from infected files. Includes Central Point's Virus Protection Service Plan to keep your system protected against the latest strains.



PFS Preface	47
Pop Drop Plus	53
PrintRate	55
ProComm Plus	65
Prodigy	25
QA Plus	85
QEMM 386	59
QRAM	49
SideKick Plus	119
Sideways	55
SmartComm Exec	69
Software Carousel	43
Super PC Kwik	43
XTree Gold 2.0	89



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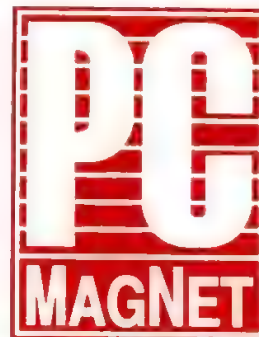
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2. When you receive a CONNECT or CARRIER DETECTED message, enter **Ctrl-C**.
3. At the HOST NAME prompt, enter **CIS**.
4. At the USER ID prompt, enter **177000,5000**.
5. At the PASSWORD prompt, enter **PC*MAGNET**.
6. At the Enter agreement number prompt, enter **Z10D9000**.
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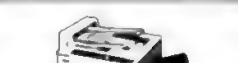
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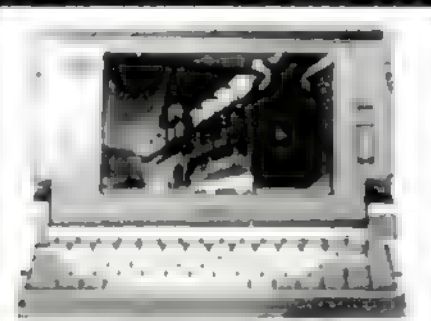
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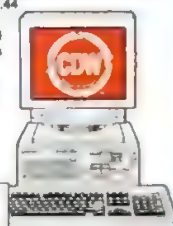
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ETHERNET For PS/2 (NE/2)	251.72
ETHERNET Board (NE2000)	187.06
ETHERNET Fisa (NE3200)	756.18

3Com

3COM 3C503 TP 10 Base T	\$293.41
3COM 3C507 Ethernet Card	294.37
3COM 3C503 Ethernet	199.70
3COM 3C505B Ethernet Plus	583.81
3COM 3C523 MCA Ethernet	280.46
3COM Ethernet Repeater	848.31
3COM 3C501 Ethernet Board	322.73

THOMAS-CONRAD

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6045 Arcnet 16-Bit	205.23
6142 TP+ Arcnet	103.53
6046 PS/2 Board Arcnet	228.16
6150-10 8 Port Smart Hub	506.65
6150-11 16 Port Smart Hub	691.01
6045 Twisted Pair Plus Ethernet	228.07
6046 Twisted Pair Plus Ethernet	245.11
4045 16/4 Token Ring XT/AT	510.23

SMC ACCESSORIES

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3508TP Concentrator BNC	697.73
3508TP Concentrator TP	727.27
Active Hub 8 Port Twisted Pair	365.91

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3008 TP 10 Base T Ethernet	199.48
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3016 TP 10 Base T 16-Bit Ethernet	216.92
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PC 500WS Coax Arcnet Workstation 16-Bit	169.41
PC 500FS TP Arcnet File Server 16-Bit	304.60
PC 550WS TP Arcnet Workstation 16-Bit	187.21
Eisa 3200 Arcnet Twisted Pair	736.00
Eisa 3200 Arcnet Coax	718.18

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WD MCA PS/2 10 Base T Ethernet	224.42
WD 8-Bit 10 Base T Ethernet	199.80
WD Ethernet Plus/PS/2 Coax	247.13
WD Elite 16-Bit Ethernet Plus Coax	173.84
WD Elite 8-Bit Ethernet Plus Coax	147.06
WD Elite Combo Ethernet TP, Coax, AUI	195.57

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Arcnet Pocket Adaptor RJ45	239.77
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ARTISOFT

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LANtastic 2Mbps Adaptor	140.58

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BORLAND Quattro Pro Network Node	185.18
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DELTA TECH Direct Net Menu	148.22
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LOTUS 1-2-3 3.2.2 Network Node	262.88
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LOTUS Symphony Server	599.13
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SONY CDU-54101 Internal SCSI CD-ROM	418.32
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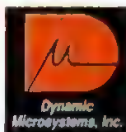
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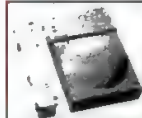
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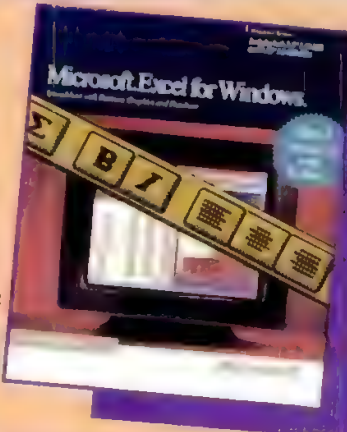
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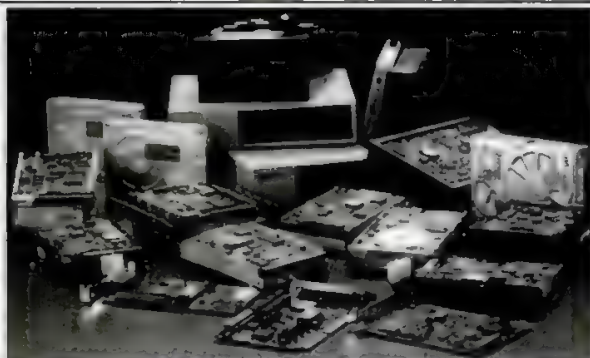
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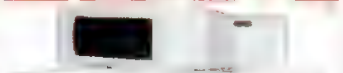
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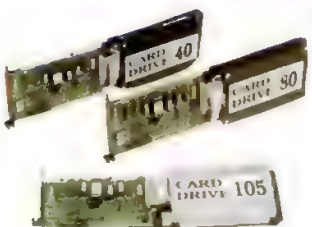
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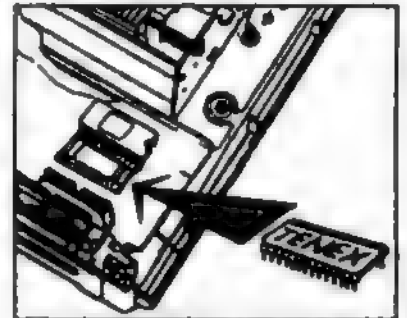
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Advisor

Help for Readers Making Personal Computer Decisions

BOOTING FROM B:

Recently, I finally upgraded from an XT clone to a 25-MHz 80386 machine. Unfortunately, several of my most cherished games did not survive the move; the 5.25-inch floppy disk drive on my new machine is configured as drive B:, and these self-booting game disks will only boot from drive A:.

Other than switching the floppy drive cables and reconfiguring my machine (which I am reluctant to do), are there any other options available? Does a software program (commercial or otherwise) exist that will permit rebooting off floppy drives other than drive A:?

John M. Linebarger

Albuquerque, New Mexico



You don't have to search for your screwdriver; I've found two software utilities that let you boot your system from B:.

The first is *B:Boot!* (YWSOFT Co., Bloomington, Ind.; 812-857-4772; \$19).

The second is a shareware program called *Boot-B:* (Solutions by the Numbers, Germantown, Md.; \$10). You can download *Boot-B:* as BOOT-B.ZIP from Library 6/Advisor of the Utilities/Tips Forum on Ziff-Net (see page 8 of this issue for information on how to join).

These programs do their magic by altering the boot record on a DOS-formatted 3.5-inch floppy disk that you put in the A: drive. When you reboot the system, the boot record of the A: drive is read first, and it redirects the boot process to B:. There are some limitations with this—for example, if your B: drive requires a special driver to be loaded in CONFIG.SYS for it to be accessed, these utilities won't work, since the boot record of the disk is processed before CONFIG.SYS is loaded by DOS.

Another limitation that you

should be aware of is in the games themselves. Many of the older games had their timings tied to the system clock, and it's possible that the game may be unplayable on your faster 80386. The only way to be sure, though, is to experiment.

OS/2 PROGRAMMING

I would like to learn how to write programs for Presentation Manager under OS/2. Although I have seen hundreds of books on writing C programs for DOS, Unix, or *Microsoft Windows*, I haven't found any information about writing programs for OS/2.

If you could tell me how to get information on this subject, I would appreciate it. Incidentally, what language is OS/2 written in?

James Cude
Brady, Texas



Your first stop should be back issues of *PC Magazine*. Starting in the September 29, 1987, issue, contributing editor Charles Petzold has taken programmers on a guided tour of the OS/2 kernel, the GDI (graphics device interface) and just about every nook and cranny

of the operating system. In recent months, he's switched his attention to *Windows* but through '88, '89, and '90, he gave extensive insight into OS/2 programming techniques.

You can get a more concentrated dose of Petzold's insights in his book, *Programming the OS/2 Presentation Manager* (Microsoft Press, Redmond, Wash.; 800-426-9400, 206-882-8080; \$29.95).

For an overall view of the philosophy behind OS/2 as well as its structure, you should get *Inside OS/2* by Gordon Letwin, the chief architect of the system (Microsoft Press; \$19.95).

Contributing editor Ray Duncan's *Advanced OS/2 Programming* (Microsoft Press; \$24.95) covers the kernel functions of OS/2.

While both these books cover only up to OS/2 1.1, they'll give you the foundation you need to get started—the reference manuals that come with the OS/2 Programming Toolkits from Microsoft (OS/2 Presentation Manager Toolkit; Microsoft, Redmond, Wash.; 800-426-9400; \$500) or IBM (OS/2 Programming Tools

- **BOOTING FROM B:** How to bypass the A: drive when you need to boot from a floppy.
- **OS/2 PROGRAMMING:** Information sources for programming in OS/2.
- **MORE CHARACTERS ON A WORDPERFECT SCREEN:** Expanding VGA screens to greater than the 80 by 25 default.
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and Information; IBM, Armonk, N.Y.; 800-426-2468, 914-765-1900; \$650) will include the information on the latest version (OS/2 1.3 at the time of this writing, with OS/2 2.0 due out sometime this year).

OS/2 is written mostly in 80286 assembler, with the balance written in C.

MORE CHARACTERS ON A WORDPERFECT SCREEN

I am a typical middling-technical PC user in a typical PC-infested office. Most of us use *WordPerfect* 5.1 on our 286 or 386SX machines with multiscanning monitors and VGA cards (Paradise, Video Seven, VGA Wonder) that support 800 by 600 modes.

I have a minor complaint: There is no sane way with any of our systems to write anything that uses large fonts! Take for example a typical letter, printed in a 12-point Times Roman Simulacrum. Character-based *WordPerfect* pans incessantly in normal VGA (640 by 480) mode with any such document, making it impossible to read. *WordPerfect* text-mode drivers support some extended modes with dubious results.

My question is: Why do none of the cards support the obvious, which would be a 100-character by 30-row screen, using the standard VGA text box? What do we have to do to obtain the obvious?

Walter L. Sass

Somerville, Massachusetts



There are a number of ways to increase the number of columns and/or rows that can be displayed on a VGA screen, not only for *WordPerfect*, but for any character-based application that detects and uses screen sizes other than the DOS default 80 columns by 25 rows.

WordPerfect Corp. provides better support than most software

Advisor

publishers, and one of its recent upgrades to the *WordPerfect* drivers may have the improvement you need. Video drivers for *WordPerfect* (WordPerfect Corp., Orem, Utah; 800-321-4566, 800-225-5000) are issued as they become available.

You can obtain a disk containing the latest drivers for a small fee directly from WordPerfect Corp., or you can download the ones you need from the WordPerfect Support Forum on CompuServe (GO CIS:WPSGA).

Just about all VGA cards come with a disk of utilities that allow you to change video modes from the DOS prompt. If you didn't receive such a disk when you bought the VGA card, it's quite likely that new drivers and utilities are now available. You can contact the manufacturer of the card for the latest versions, and in some cases download them from the vendors' support BBS.

In order to use an external utility that changes the video mode with *WordPerfect*, you have to set it up to automatically detect the number of screen columns and rows; this is done through the Setup screen (Shift-F1). Choose option 2 (Display), and then set option 3 (Text Screen Type) to "Auto Selected."

If you can't find a good util-

ity for your boards through these methods, there's still a good alternative.

The product that provides the best control for your VGA and EGA video is *UltraVision*, Version 2.0, (Personics Corp., Maynard, Mass.; 508-897-1575; \$119.95). Depending on the combination of video card and multiscanning monitor, *UltraVision* can give you up to 20 different screen sizes, ranging from 80 by 25 to 132 by 60 (including a 108 by 25 or 108 by 36 that's very close to your 100 by 30 preference).

UltraVision also provides a number of different screen fonts, which come in different sizes to match the different screen sizes; the text is quite readable at even the smallest size. Text resolution is improved by UV—the standard 9 by 16 matrix for each character is increased to a 9 by 20 matrix, making the characters sharper and easier to read.

Drivers are also included for applications such as *Lotus 1-2-3* and *dBASE III* that don't otherwise support a variety of screen modes. (*UltraVision* was last reviewed in the May 29, 1990, issue of *PC Magazine*.)

UPGRADING PC MAGAZINE UTILITIES

I have used *PC Magazine's* DR.COM, CO.COM, and RN.COM utilities for several years. Recently, to my dismay, I discovered that

RN.COM doesn't work under DOS 4.01. Can anything be done to solve this problem?

Arthur E. Hass
Rockville, Maryland



PC Magazine contributing editor Michael Melford (the author of RN.COM) "heard" many complaints through PC MagNet about this incompatibility when DOS 4.0 first came out. He responded quickly with an update that solved the problem.

You can download RN4.COM from Library 2/PCMag Utils in the Utilities/Tips Forum on ZiffNet (see page 8 of this issue for information on how to join).

SOFTWARE FOR AGRICULTURE AND OTHER INDUSTRIES

I would like your help in locating a source for agricultural-related software. I have heard that several packages are available, but no one has been able to direct me to a specific source.

Can you offer some help, or at least get me going in the right direction?

John H. Perkins
Claxton, Georgia



There isn't much discussion about this type of software in *PC Magazine* due to the relatively small size of the audience, relative to the entire population of PC users.

Software publishers classify any program designed to help people in a specific industry as "vertical market software." Vertical markets are narrowly defined groups with special needs. "Horizontal software" (like *WordPerfect*, *Paradox*, and *PC Tools*) can appeal to everyone across the spectrum.

Since *PC Magazine* appeals to a broad audience, we don't cover vertical software. The best way to research these products is with Computer Library, an on-line service available through CompuServe (type GO:COMPLIB from any CompuServe or PC MagNet prompt).

There are quite a few applications available for agricultural management; these range from accounting packages geared toward the needs of farmers, to

packages that help determine proper feed mixes.

A search of Computer Library will reveal dozens of programs that are specific to that type of business.

Here's a sampling of what you would find on Computer Library when searching for agriculture:

Agricultural Software Consultants Inc. of Kingsville, Tex. (512-595-1937), puts out several programs that help calculate proper feed mixes for maximum production, such as *Dairy MixIT+* (\$995) for dairy farmers, and *MixIt-3* (\$995) for others.

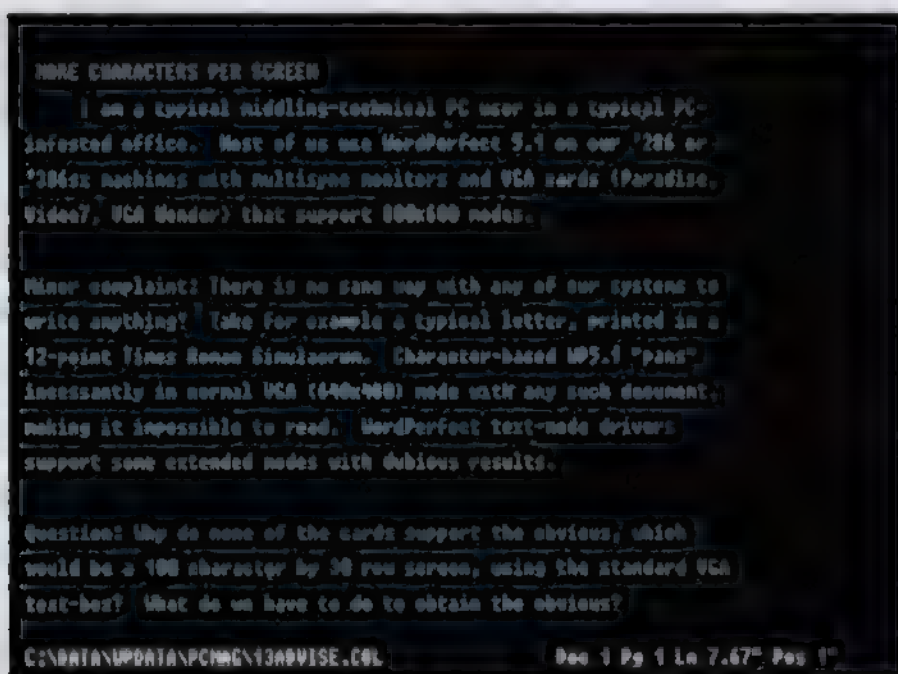
Doane Software (division of Doane Agricultural Services, Cherry Valley, Ill.; 800-422-2434, 815-332-5900) also has a varied line of software applications geared toward farmers. *Crop/Livestock Profit Projector* (\$95) helps project profits based on costs and market conditions. *DairyTRAK Plus* (\$1,990) is an inventory and record-keeping system for large herds, while *DairyTRAK Recordkeeper* (\$695) does the same for farmers with smaller herds.

There are also accounting programs for agricultural businesses. *Agricultural Accounting System* (AG Computer Service Inc., Amarillo, Tex.; 806-353-9967; \$200 per module) provides functions such as monthly balance sheets, cash flow analysis, check writing, general ledger, and IRS forms. *Agri-Ledger* (Small Business Computer Systems Inc., Lincoln, Nebr.; 402-467-3591; \$550) is a double-entry system that provides billing, accounts receivable, general ledger, and planning and analysis spreadsheets.

These applications only represent a small sampling of the agricultural software products available. Check with the vendors for information on the other applications they have if the ones mentioned don't exactly fit your needs.

ASK THE ADVISOR

Send your questions to PC Advisor, One Park Avenue, New York, NY 10016, MCI mailbox PC MAGAZINE, or upload them to PC MagNet (see the instructions for joining on page 8 of this issue). Sorry, but we cannot send personal replies. ■



With *UltraVision* installed on a VGA system, you have a choice of many different character sizes for popular DOS applications. In this screen, *WordPerfect* is displaying text at 80 by 36 (80 characters per line, and 36 lines per screen).



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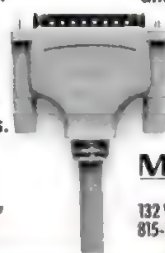
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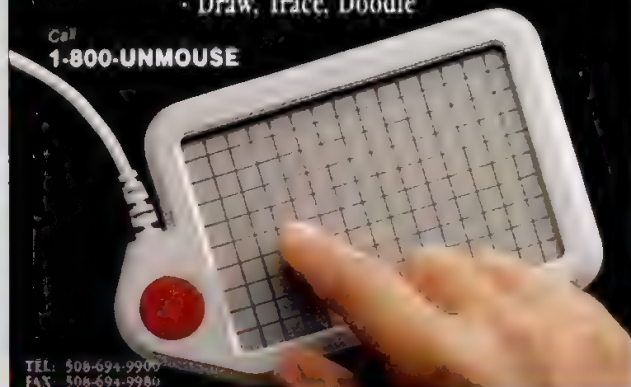
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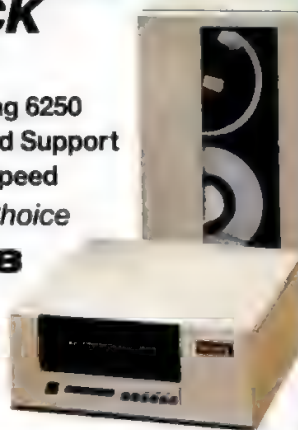
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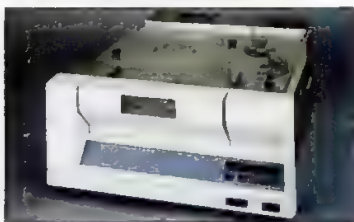
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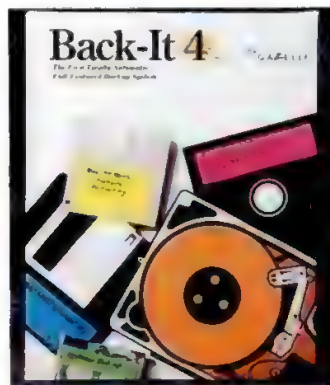
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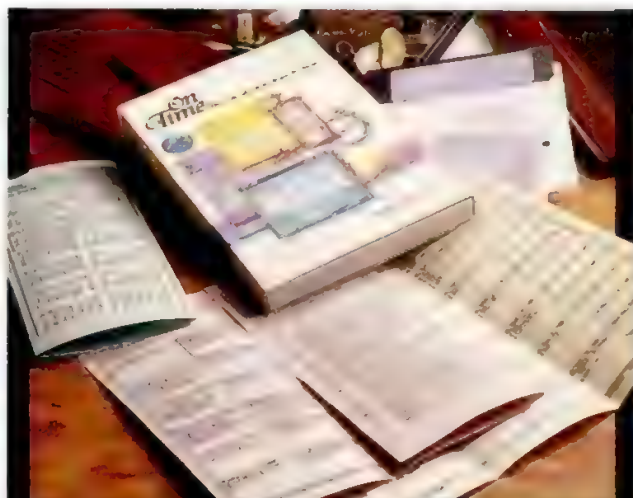
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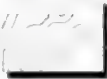
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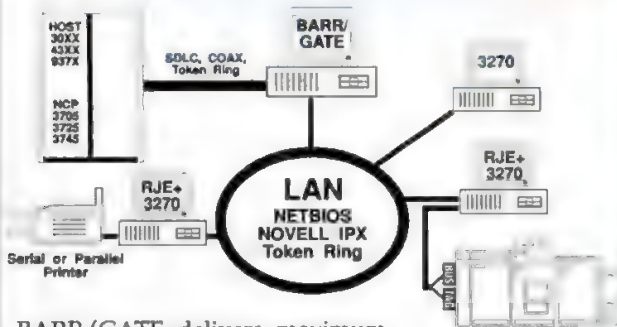
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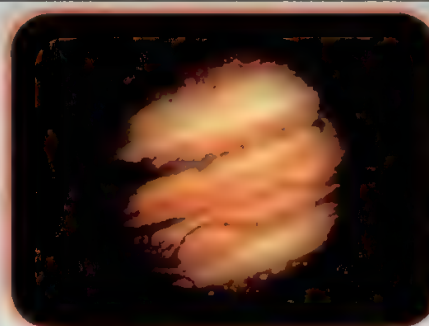
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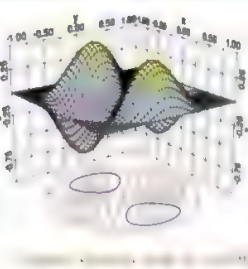
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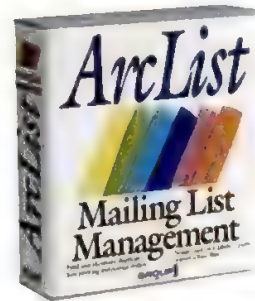
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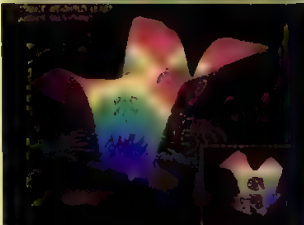
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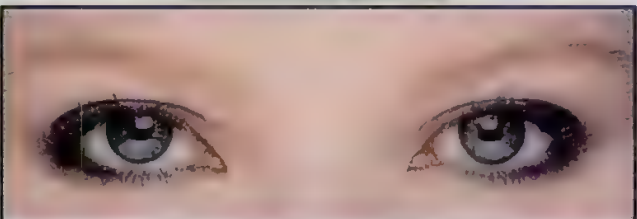
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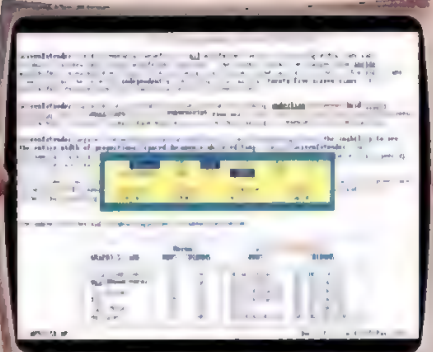
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3C87-57	\$290.00
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3C87-59	\$300.00
3C87-60	\$305.00
3C87-61	\$310.00
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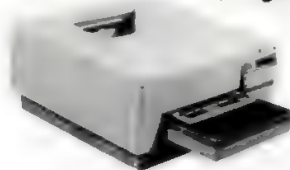
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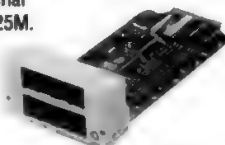
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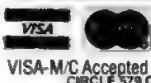
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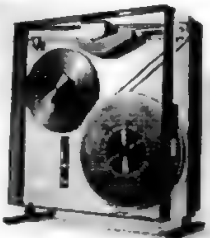
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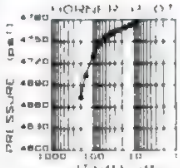
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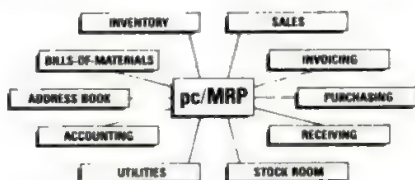
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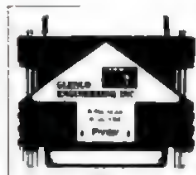
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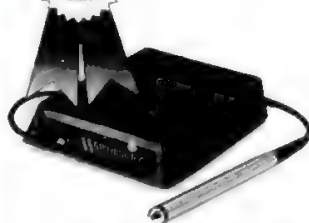
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702	HP LaserJet FAX	Hewlett-Packard Corp.	46	DATABASES				A FoxPro UDF that lets users choose between two options.			
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■ LOW-END INTEGRATED SOFTWARE

Integrated software can be a compact, inexpensive, and efficient tool for getting work done whether you're in your home, office, or on the road with your laptop. PC Magazine Labs examines nine low-end integrated packages, ranging in price from \$59.95 to \$199, including *Framework XE*, *LotusWorks*, and *Microsoft Works*. We'll tell you how well their word processing, database management, and spreadsheet applications work together.

■ GRAPHICS SCANNERS

PC Labs examines a roundup of page and flatbed scanners, all costing less than \$3,000. We'll tell you which 8-bit gray-scale and 24-bit color scanners best suit your business's OCR and desktop publishing needs.

■ WINDOWS AND PM GRAPHICS UTILITIES

Want to know how you can improve your graphics-handling capabilities? *PC Magazine* takes a look at three useful programs that do screen capture, raster file conversion, color reduction, and a number of other graphics functions in the *Microsoft Windows 3.0* or *Presentation Manager* environment. Take a look to see how you can benefit from these image-handling utilities.

■ 386SX NOTEBOOK PCS

You'll be saying goodbye to sore shoulders forever if you purchase one of these notebook PCs. You may even want to trade in your desktop PC. Once available only as underpowered 286s, notebooks now pack 386SX power, as much as 60MB of hard disk space, and a crisp VGA display into a 7-pound package that will fit into your briefcase and still leave room for all your papers. PC Labs tests 27 lightweight portable 386SX machines. ■



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After Hours

Products for the Leisure Side of Personal Computing

CD-ROMs Offer World-Class Art Libraries at Your Fingertips

EDUCATION
by Don Trivette

One of the inherent advantages of the CD-ROM format is its ability to store the huge amounts of data necessary to display high-quality graphics. That voluminous storage capacity is used to great effect in two beautiful new "art books" just out on compact disks.

Impressionism, published by Quanta Press (\$129), presents the work of dozens of artists who painted in the independent style known as the Impressionist school. Many of the 600 canvases are by artists like Cezanne, Degas, Gauguin, Lautrec, Manet, Monet, Pissaro, Renoir, Seurat, and van Gogh; these are familiar household names. Their works hang in museums and private collections worldwide. This disk includes such well-known paintings as Monet's "Impression,

Sunrise" (from which the movement took its name), van Gogh's "The Siesta, After Millet," and Mary Cassatt's "Young Girl at the Window."

Each painting is annotated with the title, artist's name, medium, date, physical size, and location of the original. Search software lets you retrieve pictures by any of those criteria. The disk is organized into DOS subdirectories that contain the photographic images in standard .PCX format. You can use other graphics programs to search, copy, print, and display the images—a real bonus for teachers and curators who might want to pull off subsets for display and critique. There is also an ASCII catalog file that can be read by a text editor or a list program (which is included on the disk, though it is undocumented).

Impressionism actually has

two complete sets of the photographs: One is for VGA monitors and the other for 256-color Super VGA. Drivers for popular SVGA cards are provided as batch files. For example, I use a Video Seven Super VGA card, so VIDEO7 is the command that brings up *Impressionism* on my PC. The CD-ROM is completely self-contained and requires no special hard disk installation, which is a real bonus for the occasional user.

Impressionism is the first of a series that Quanta intends to publish. Disks of Old Masters, Abstract, Realism, Art Nouveau, and Art Deco are all in the planning stages. Personally, I would rather leaf through a high-quality book than look at a computer screen, but for educators, museums, and libraries, the CD-ROM format offers near indestructibility and greater flexibility than hard copy media.

Indeed, at least one museum has allowed the catalog of its permanent collection to be placed on CD-ROM. Abt Books of Cambridge, Mass., publishes the *Catalog of the National Portrait Gallery: The Permanent Collection* (\$495), which is a part of the Smithsonian Institution.

The 25-year-old National Portrait Gallery is charged with collecting and maintaining images of Americans who have made significant contributions to the history of this country. Currently, the collection numbers about 3,000 items in a wide variety of media including oils, acrylics, photographs, watercolors, sculptures, and bronzes. The gallery strives for notable works of art, but the quality of the art is secondary to the achievements of the individual. Men and women selected for the collection come from fields as diverse as science, the military, music, education, and religion.

I suppose everyone has their favorites, but I must admit that I

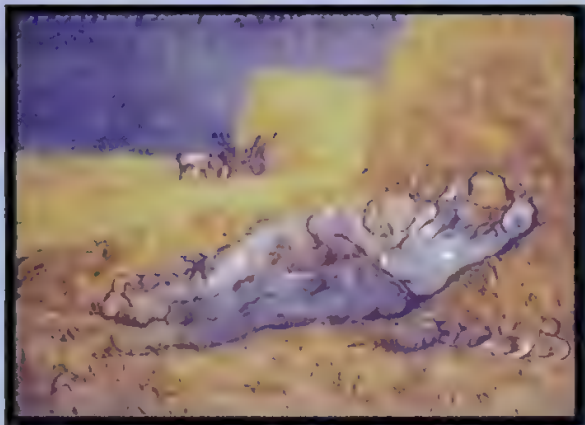


was disappointed by some of the omissions. Tom Watson (founder of IBM), Chester Carlson, (founder of Xerox), and Philo T. Farnsworth (one of the inventors of television) are all missing. Many of the entertainers were affiliated with the symphony and the opera; the only "pop" singers I could find were Dinah Shore and Judy Garland. Where is Elvis?

The *National Portrait Gallery* disk comes with its own search-and-retrieval software, part of which must be installed on a hard disk. The program is a memory hog; in fact, I had to eliminate almost everything in my AUTOEXEC.BAT and CONFIG.SYS files in order to get the disk to "play." Once up and running, however, the program performed reliably and quickly.

There is almost no information about the subjects, which surely detracts from the product.

CONTINUES



Van Gogh's renowned "The Siesta, After Millet" is one of the masterpieces included in *Impressionism*, a new CD-ROM from Quanta Press.

After Hours

Impressionism

CONTINUED

In the gallery itself, each portrait is accompanied by several descriptive sentences; the compact disk lists only the artist and media, along with the subject's name, dates of birth and death, and occupation. For example, it says Henry Miller Shreve was a steamboat captain. I want to know on what river, and why he was important enough to be included in the *National Portrait Gallery*. Was Shreveport, Louisiana, named for him?

The images in *National Portrait Gallery* are contained in a single 100-million-byte file, but for educational purposes you can use the "write-image-to-disk" command to export a picture in the .PCX format. For commercial use, The National Portrait Gallery sells prints of most

works. About 400 of the photographs are in color, and in that respect this \$495 electronic version is superior to the \$25 black-and-white paper catalog.

Impressionism and the Catalog of the National Portrait Gallery make fine additions to an art library, although both are priced for institutions and not for the home market. In addition to a lower price, it would be nice if CD-ROM publishers could settle on universal search-and-retrieval software—software that would work on both text and pictorial data. Until that happens, the CD-ROM market will probably remain fragmented and slow growing.

List Price: *Impressionism*, \$129. **Requires:** 640K RAM, CD-ROM drive, VGA or Super VGA graphics, DOS 3.0 or later, Microsoft CD-ROM extensions, Version 2.1. 286-based PC or better recommended. Quanta Press, 2550 University Ave. West, #245N, St. Paul, MN



The National Portrait Gallery was founded to preserve the images of great Americans like George Gershwin, the composer and pianist.

55114; 612-641-0714.

CIRCLE 639 ON READER SERVICE CARD

List Price: *Catalog of the National Portrait Gallery: The Permanent Collection*, \$495. **Requires:** 640K RAM, CD-ROM drive, VGA graphics, DOS

3.1 or later, Microsoft CD-ROM extensions, Version 2.1. 286-based PC or better recommended. Abt Books Inc., 146 Auburn St., Cambridge, MA 02138; 617-661-1300.

CIRCLE 640 ON READER SERVICE CARD

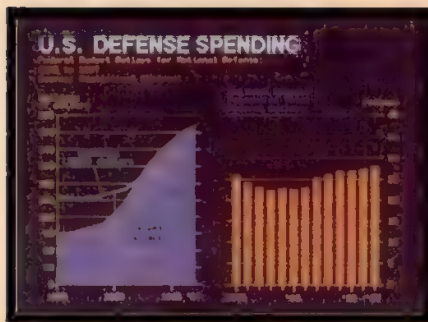
Time Magazine Offers a CD-ROM Archive for 1989 With Selected Earlier Text



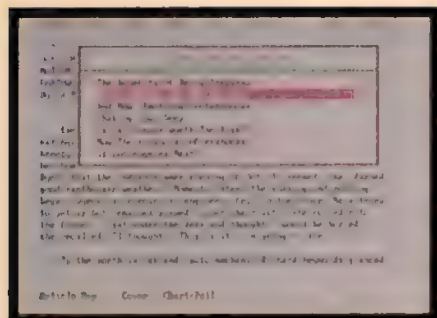
It was with relish that I popped the *TIME Magazine Compact Almanac* into the CD-ROM drive. This single shiny compact disk contains the full text of all 52 issues of 1989, many articles from the years 1980 through 1988, and representative selections dating back to *Time's* founding year of 1923. In addition to the *Time* magazine content, there is a first-rate almanac

covering both the U.S. and foreign countries.

An archival disk is only as good as the software used to retrieve the data. The *TIME* retrieval engine is one of those rare programs that needs no instruction manual (although one is included) and no tutorial; the software is both well designed and well behaved. The Esc key always takes you back to the previous screen, and the program includes niceties that you expect to find in a quality product, like



The *TIME Magazine Compact Almanac* offers graphs and tables from the *Statistical Abstracts of the United States*.



The *TIME* CD-ROM has an easy-to-use retrieval engine that supports cross-references to related articles.

bookmarks, and mouse and printer support. The program loads in one easy step, and you are off to the library.

The developers spent time on the retrieval engine, and it shows. A pull-down menu lets you retrieve articles in three ways. "Browse" is the electronic equivalent of thumbing through page by page, "Search" lets you enter a word (or three) to pull up articles on specific topics, and "Index" is a list of all key words on the disk. You find an article, press the Enter key, and in a pleasantly short time the text appears. There are maps, charts, and cross-references to related articles, but unfortunately, the only photographs are

the Man-of-the-Year covers for the 1980s.

The almanac is worth more than a passing mention. The complete *Congressional Directory*, documents of American history like the Constitution and the Mayflower Compact, and 400 tables from the *Statistical Abstracts of the United States* make this an excellent reference source. The information in the foreign section comes from the CIA's *World Factbook*.

I was once a regular reader of *Time*, but when my subscription expired I didn't renew. I didn't realize how much I had missed it until I began browsing through this disk. Here are stories from

CONTINUES

After Hours

Time on CD

CONTINUED

the Roaring Twenties, the depression thirties, the bellicose forties, the button-down fifties, and the hippy sixties. (The seventies and eighties are too recent to hold my attention.)

Before I knew it, I had spent several pleasant hours perusing the past, but not nearly as many as I would have liked. If the *TIME* disk has a flaw, it's the sparsity of articles from old issues. As a history buff, I love reading magazines from 1928, 1936, 1942, and 1957, for example. The editors selected "meaningful" articles from the past, but I want them all.

I also have a minor problem with the name of the product. Billed as the 1990 edition, it doesn't contain the full text of the magazine for that year, as I would expect, but rather for the preceding year—1989. The publisher is currently working on *TIME* 1991, which will be re-

leased this fall and will contain the 1990 issues of the magazine. The good news is that future editions will be accumulative; that is, 1991 will have the full text of both '89 and '90 as well as some additional historical material and VGA photographs. How long can the accumulation continue? The publisher hopes that by 1994, when disk capacity is reached, quad-density CD-ROM drives will be common.

Aimed at schools, libraries, and institutions, *TIME Magazine Compact Almanac* is right on target. It's easy to use, fast, and comprehensive. It is also a great reference work for the home and a treat for fans of recent history, but at \$195, it's a bit steep for most home users.

List Price: *TIME Magazine Compact Almanac*, \$195.

Requires: 640K RAM, EGA or VGA graphics, Microsoft CD-ROM extensions, Version 2.1. 286-based PC or better recommended. Compact Publishing Inc., P.O. Box 40310, Washington, DC 20016; 202-244-4770.

CIRCLE 641 ON READER SERVICE CARD

Sierra's Latest Space Quest Redefines Hanging Out at The Neighborhood Mall

GAMES
by Lori Grunin

Tear a hole in space-time and jump into the long-awaited *Space Quest IV: Roger Wilco and the Time Ripper*, from Sierra On-Line. You'll find yourself in a fall-off-your-chair-laughing world of gags, gadgets, and time-loop paradoxes. As the game begins, a helmeted stranger saves Roger from abduction by tossing him into a time rip and landing him on Xenon—in *Space Quest XII*! From there, Roger bumbles his way from *Space Quest* to *Space Quest*, until he finally saves his son from our old friend Sludge Vohaul.

I had mixed reactions to Roger's bumbblings. I suppose some 13-year-old boys out there will think that the Latex Babes of Estros sequence from *Space Quest X* is almost funny. These buxom cartoon women, who run

around in bathing suits and boots, were probably ousted from *Leisure Suit Larry* for excessive silliness. When Roger, the big, handsome, janitor-cum-hero, saves these helpless torturers-cum-sex kittens from the ever-so-scary sea slug, I guess it makes sense for them to run off with him to the Galaxy Galleria. They probably went to buy warmer clothing.

But I eventually forgave the Two Guys from Andromeda (a.k.a. Mark Crowe and Scott Murphy, the game's designers) for the Latex Babes lapse, because the rest of this game is hysterical. *Space Quest IV* is at its best when parodying marketing, the media, and bleeding-edge technology. The bulk of the game is spent at the aforementioned mall, which provides ample fodder for more sophisticated humor and sight gags. The mall setting also presents the

In addition to many mind-bending time/space paradoxes, *Space Quest IV* offers digitized, hand-painted graphics.



opportunity to play a couple of (thankfully) optional arcade sequences. Most of the puzzles are clever, although there are a few spots where only by accident do you uncover a necessary code or place yourself in a position required for the game to continue.

SQIV uses the great new graphics system that premiered in *King's Quest V* and *Rise of the Dragon*—digitized, painted backgrounds that allow the designers to optimize the graphics for the 256 colors of MCGA mode. When Roger pays a visit back to *SQI*, the original graphics from that game are cleverly integrated with the newer ones.

The icon-driven menu requires little or no typing, but it does have an irritating propensity to pop up when you try to move north. That's a real nuisance when you're trying to escape such unfriendlies as the time police and the killer droids.

The movement parser has also been vastly improved. You can now point to a location and Roger will actually walk there without stopping unnecessarily at silly obstacles. Of course, the sound lives up to the usual high *Space Quest* standard.

There are only a few puzzles that a proficient adventurer or graduate of the previous three *Space Quests* might find challenging, but the game has enough rib-ticklers in it to leave everyone feeling they got their buckazoid's worth.

List Price: *Space Quest IV*, \$59.95. **Requires:** For the 256-color version: 286-based PC or better, 640K RAM, VGA or MCGA graphics adapter. For the 16-color version: 512K RAM; EGA, VGA, MCGA or Tandy 16-color graphics. Sierra On-Line, P.O. Box 485, Coarsegold, CA 93614; 800-326-6654, 209-683-4468.

CIRCLE 642 ON READER SERVICE CARD

Oral History Software Helps You Recall, Organize, and Publish Your Life Story

MEMORIES
by Charles Tarr

Inside every person, there's a story waiting to be told. It's a shame that so few people ever take the time to preserve their memoirs; more of us probably would, if we had a tool to help us organize and remember our observations and experiences. *Memories?*, from Senior Software Systems, does just that. *Memories?* offers PC novices and experts alike a well-constructed framework for recalling, recording, and publishing

their personal life histories.

In effect, *Memories?* helps you create your own book: *The Story of Your Life*. The software is organized into eight major chapter headings, with four to twenty-two topics within each chapter. More than 1,200 questions "jog" your memory while you jot the answers down at your PC keyboard.

The chapters represent major time periods in your life, from birth through the present. The topic headings help you flesh out each period with specific

CONTINUES

After Hours

Memories

CONTINUED

recollections, focusing on family, friends, significant events, and so on. The context-sensitive, open-ended questions help you remember information and come up with complete answers. For example, the chapter "Early Life Memories" has 15 topics, including "My Home," "School," and "Happy Times/Sad Times." Ninety questions (such as "Were those early school years fun and exciting, or were they difficult and frightening, or some of each? Why? What made them that way? I'd like to hear about it...") help you concentrate on the important details of your past.

The beauty of *Memories?* is that it's incredibly easy to use. The program presupposes no prior PC knowledge; it comes with a clear, easy-to-follow manual that walks you through the program's setup, and a tuto-

rial. Pull-down windows and help screens aid you in recalling and capturing your personal history. There is an autosave feature, which is particularly important in software that records such precious information. A convenient pull-down notepad lets you store thoughts that are relevant to chapters other than the one you are currently working in.

Memories? uses a basic text processor to record answers; you can enter, add, or delete text (as well as nonrelevant chapter and topic headings). There is a word-wrap feature, and the "response" window can be expanded to cover the whole screen. You can print out any chapter, or the complete book, including a table of contents, at any time.

Some amenities are missing, however. There is no spell-checker or font selection. Users cannot cut and paste text directly from the notepad into their book, and text centering must be done by eye, because the program is WYTIWYG (what you type is what you get). Experienced PC

users may prefer to export their books in ASCII format and use more-sophisticated word processors to polish and refine their creations. Better yet, the file could be imported into a desktop publishing package.

Memories? has universal appeal. My octogenarian relatives have used it to record events and anecdotes. I've been using the "Life as an Adult" chapter and the "Children" topic to record changes in my life since my son was born. Parents can use *Memories?* to help record young children's observations; my wife

and I have asked our five-year-old son Benjamin to record some of his kindergarten adventures for the "Early Life Memories" chapter. We've exported this chapter to *WordPerfect* and have incorporated scanned photographs and some of his artwork to enhance his "adventures." *Memories?* are made of this!
List Price: *Memories?*, \$79.95.
Requires: 256K RAM, DOS 3.0 or later. Senior Software Systems, 8804 Wildridge Dr., Austin, TX 78759; 800-637-9949.

CIRCLE 643 ON READER SERVICE CARD



Memories? puts you in touch with your past by posing carefully chosen questions that stimulate and guide your recollections.

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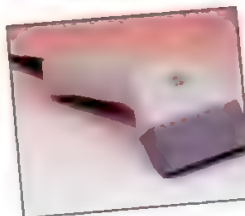
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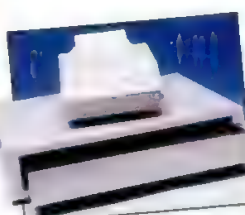
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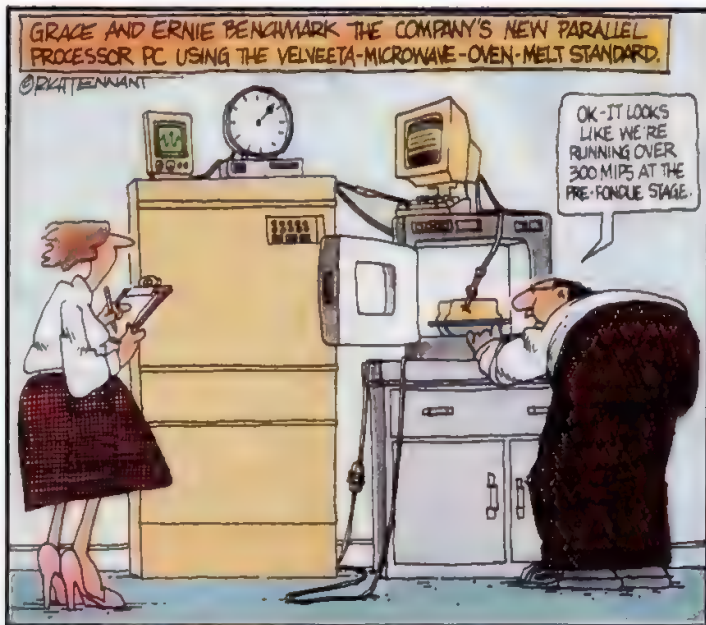
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Sage Advice From the Manual

"Each time you turn on the system unit, it performs a power-on self-test. The self-test takes several decades of second to complete, depending on the amount of memory installed in the system unit."

—Goldstar GS 317 Operations Manual

More Sage Advice

"Requirements: The computer needs to have a clock calendar. And, it needs to be plugged in and turned on and you need to have paid the electric company recently. Or, you could use lots of batteries and a DC to AC converter. Or, you could use a lap top computer."

—graphics-MENU, Version 3, Island Systems, Operations Manual

Amazing Facts: The 286SX

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—Intelligence Technology Corp. brochure

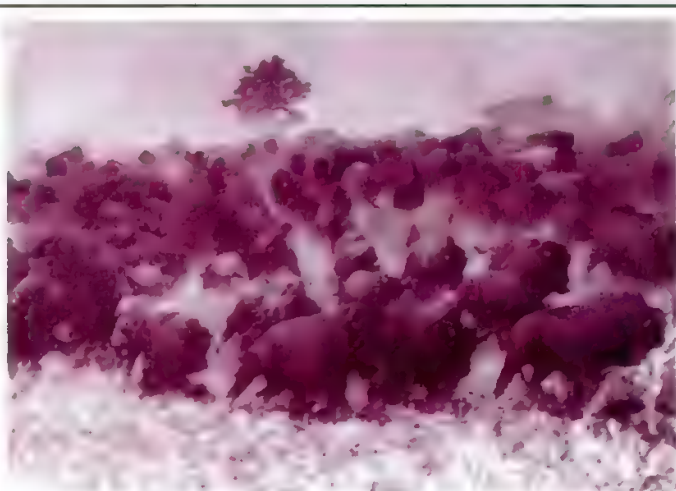
COMMAND LINE OPTIONS

Syntax: HW [d:] [/FILENAME] [/b] ... [/s]

More than one option can be specified, but if [d:] is used, it must occur first. A space must be used to separate each option.

d:	Tree to be logged
/FILENAME	Execute macro FILENAME
/b	Force black & white
/cP	Default COM port (P=1-8)
/q	Turn sounds off
/a	Assume local mode

Woodsman, spare that D: command-line options as described in the quick-reference card for Datastorm Technologies' HotWire file-transfer program.



Is corporate America bullish on Unix?

channel development for the the new SPARCstation IPC was

VarBusiness (October 1990) says they're bulls. We say bison.

If your entry is used in Abort, Retry, Fail? we'll send you \$50 and a PC Magazine T-shirt. Caution: In case of multiple entries, the postmark date, neatness, and completeness of entry are considered. Winners this issue: Greg Schmidt (ITC 286SX), Milton Goetz (HotWire), Frank Runner (Unix Bison), Travis Powell (several decades of second), John Barrier (Requirements).

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| ☐ 386 [™] -based systems | ☐ Other: _____ |
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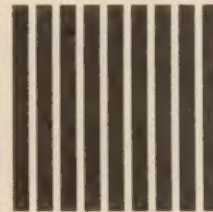


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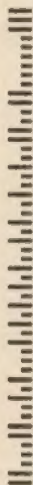


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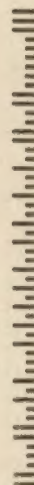


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